FLIGHT

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AUGUST 27th, 1942

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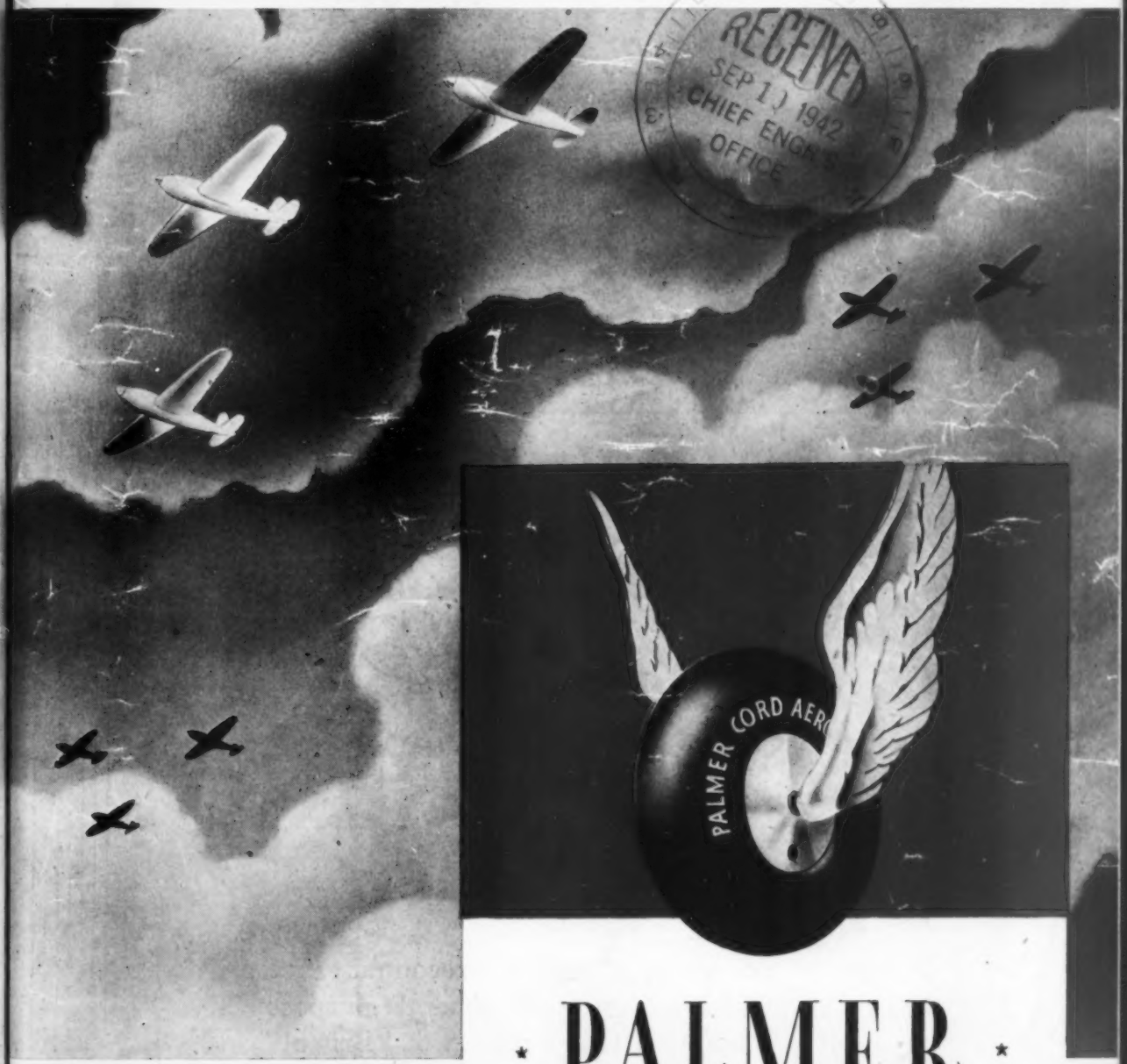

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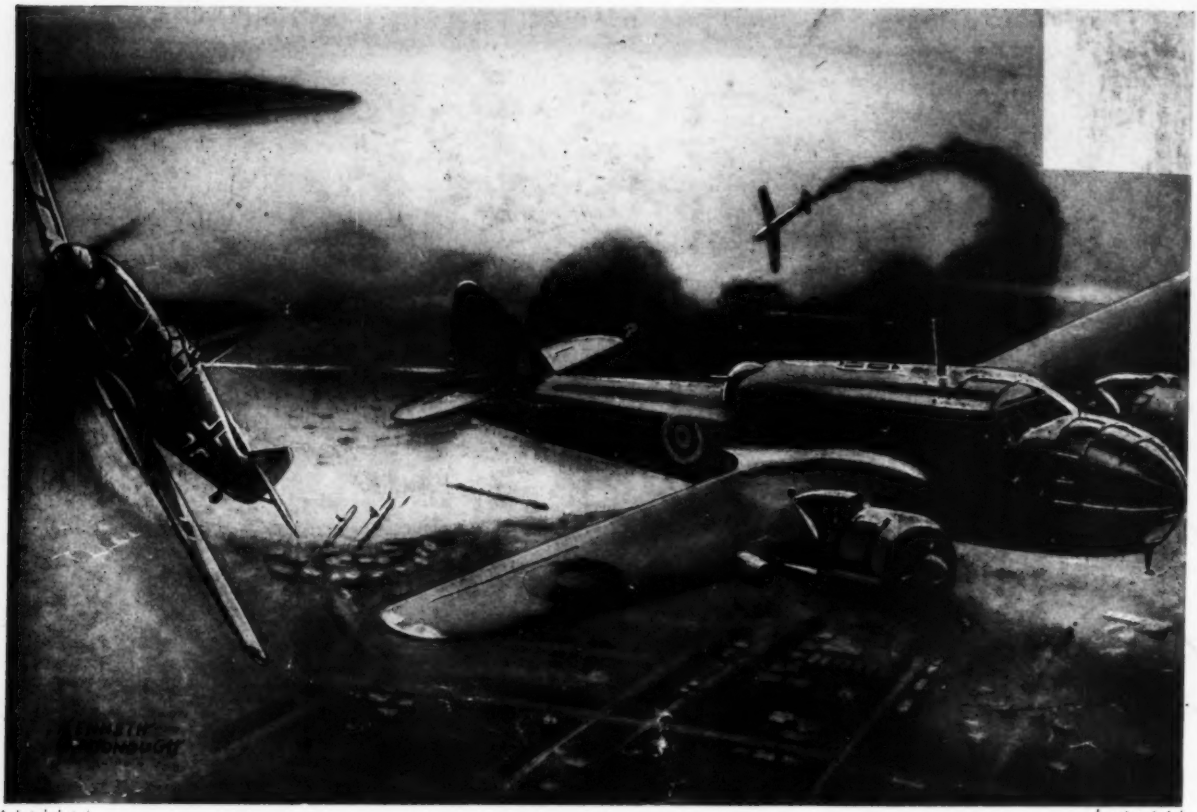

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FLIGHT and The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Anti-stall Devices

BY sending us news of a new stall-warning device recently patented by Mr. Rockefeller, of Vultee Aircraft, an American correspondent of ours revives a subject which was much to the fore some fifteen or twenty years ago. Many designers in those days were preoccupied with the idea of robbing the stall and subsequent spin of most of its terrors. The spin could be avoided, or at least its characteristics tamed, but the stall is, of course, one of the fundamental evolutions, if flying speed is lost, the aircraft must sink, even if there is no violent whipping down of the nose.

Many were the devices evolved for the purpose of giving the pilot visible or audible warning of the approach of the stall; some were very simple, others needlessly complicated. Mr. Mogens Bramson went farther than others, in that he not only designed a warning device (it was a simple vane which maintained one attitude when the aircraft was flying normally and changed to another when the angle of incidence exceeded a certain pre-selected figure), but he coupled this to a pneumatic mechanism which operated the elevators, thus preventing the aircraft from reaching the stall. The device, which became known as the Savage-Bramson anti-stall gear, would probably have come into fairly extensive use had not at about the same time Mr. (now Sir Frederick) Handley Page invented the leading-edge slot, which delayed the stalling of the wing tips and thus prevented the incipient spin from developing into a vicious one.

The new American patent is for a device with a forward-facing horn connected to a diaphragm, the change in airflow altering the pressure on the diaphragm and closing an electrical circuit which gives the stall warning. The Vultee invention does not sound particularly impressive in itself (no better than the Bramson unstable vane, for example), but the fact that aircraft engineers in America should be occupying themselves with the subject of stall-warning devices is interesting, and leads one to ponder the advisability of reviving the Savage-Bramson anti-stall gear, or some modern development of it.

Air Transport in War

ALTHOUGH everybody is now so accustomed to the marvels of flight that new instances scarcely arouse any particular excitement, the recent meetings of Allied leaders in Egypt and afterwards in Moscow were so remarkable as almost to demand commemoration by the Poet Laureate. The Prime Minister and the representative of the President of the United States, with their entourage, flew out from England. Field Marshal Smuts arrived by air from South Africa, and General Wavell from India used the same means of travel. General de Gaulle had previously arrived in Egypt by air. Sir Frederick Sykes once called Cairo the "Clapham Junction of the air," and on this occasion at least it really deserved the name. Then, while the Prime Minister of South Africa returned to his own land, Air Marshal Sir Arthur Tedder left his station in Egypt to fly on with the party to Moscow to meet the Premier of Russia. The United Nations, in the persons of their leaders, were manifestly united in fact on this occasion, and all due to the agency of aircraft.

The remarkable nature of this gathering becomes even more striking by a comparison with what happened in the last war. Then it was thought most desirable that Lord Kitchener, Secretary of State for War, should visit Russia to consult on common plans. He could not go by air; he had to trust to surface transport, and the cruiser H.M.S. *Hampshire* struck a mine off the north of Scotland, and carried the British War Minister to the

bottom of the sea. That conference, which might have been so important, did not take place. Now the leaders, hailing from America, Britain, Egypt and India all arrived safely at Moscow (despite a slight mishap to General Wavell's machine at Teheran), held what may have been an epoch-making discussion, and returned in safety.

Air transport has changed the possibilities of co-operation between far-flung allies out of all recognition. Now the leaders meet face to face and get to know each other—and we must not forget Mr. Churchill's previous flight to the United States to meet President Roosevelt—and that is infinitely better than any number of communications by cable, wireless, or even telephone. If aircraft can effect such a revolution in the relations of allies in time of war, what ought it not to be able to do for friendship between nations when once more the world returns to peace?

Fighter Umbrellas

TWICE within a few days British fighters have done really great work in providing cover for units of the Navy and the Army—in the convoy battle in the Mediterranean and in the raid on Dieppe. Other arms distinguished themselves in both actions, but in each the fighters may be called the star turn. In the convoy battle the carriers flew off nothing but fighters. The work was done by Hurricanes and Martlets of the Fleet Air Arm, and though we do not know the losses of merchant ships, it is significant that of our naval losses, only the destroyer *Foresight* was lost through air attack. The other three British warships fell to submarines. As the convoy approached Malta the R.A.F. squadrons there were able to help their naval comrades. We may be thankful that the fleet had such good fighters as Hurricanes (how versatile is the Hurricane!) and Martlets.

The raid on Dieppe will be studied by all Staff Colleges for many a long day. The success of the threefold co-operation is the outstanding feature. Everything, however, depended on the British fighter umbrella. Without its almost complete efficiency the losses to the landing craft and destroyers might well have been crippling. Though there were well over 3,000 sorties, we only lost 58 pilots and a few other members of air crews. Only three of our bombers were lost.

The raid has certainly proved that if a landing is made within the radius of action of our Spitfires, the air cover can be provided which will give the Navy and Army a free hand. The *Luftwaffe* realised in 1940 that the Germans could not invade unless Fighter Command was first mastered. Now it has learnt that Fighter Command can make possible a landing on the Continent.

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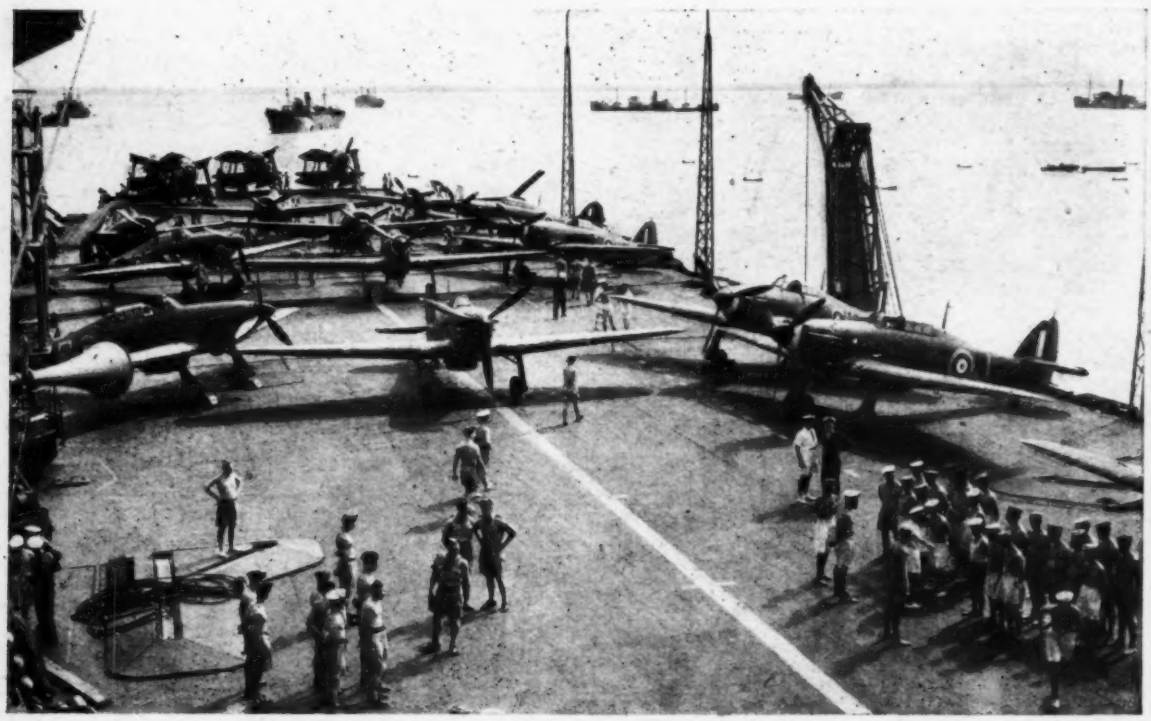


CONVOY UMBRELLA: Hurricanes, Martlets and Albacores on the flying deck of one of the four aircraft carriers which accompanied the convoy to Malta when at least sixty-six enemy aircraft were destroyed.

War in the Air

Avro Lancasters being overhauled and test-flown by their own crews before being fuelled and bombed-up for the night's operations.

The Malta Convoy Battle : Chiefs Meet at Moscow : Great Air Work in the Attack on Dieppe : U.S. Army Air Force in Action

THE story of the convoy which recently got through to Malta after heavy fighting against Axis aircraft and submarines is one to stir the blood. One fact emerges, namely, that aircraft can keep a fleet from doing its job—if that fleet is Italian and the aircraft are British. The Italian fleet was seen in the Tyrrhenian Sea, and some of our torpedo aircraft were sent out. The Italians did not feel in the mood for conversing, and withdrew. None the less, they met a British submarine and one of their cruisers parted with 60 feet of her bows. The next point to attract attention is the magnificent protection given to the convoy and its escort by the fighters from the British carriers, as well as by the remarkably fine shooting of the A.A. gunners on the ships. As the convoy drew near to Malta, R.A.F. Beaufighters came out and gave doughty help to the naval fighters, and when the distance from the island was still further decreased the Spitfires also joined in and brought great relief. But the main part of the work was done by the fighters from the carriers. The convoy was taking more aircraft to reinforce the garrison of Malta, and they probably were on the carriers, but they would not have deck-landing hooks, and so could not have been used for the protection of the convoy until the ships had got near enough to Malta for them to land there after their flights. The enemy lost in all 66 aircraft for certain, with 15 more probably shot down and another nine possibles. Of these, the guns from the ships accounted for 17 certain and 10 probables, which does the gunners infinite credit. The R.A.F. machines from Malta bagged at least 10. But the bulk of the work was done by the naval fighters. Only eight British machines and four of their pilots were lost. It was really an astounding battle.

Of Admiral Syfret's warships, H.M.S. *Eagle*, *Manchester* and *Cairo* succumbed to submarine attack, and the destroyer H.M.S. *Foresight* to a torpedo from the air. The losses among the merchant ships have not been announced.

A good deal may be read into the visit of Air Marshal Sir Arthur

COLD DRAUGHTS : Fighter pilots of the Russian Northern Fleet pass the time between alarms. They fly lease/lend Kittyhawks.

WAR IN THE AIR

Tedder to Moscow as one of the party which accompanied the Prime Minister. One may imagine that it was thought advisable to give Mr. Stalin and his staff first-hand news about the Battle of Egypt, and obviously it would not have been possible to take either General Auchinleck or General Alexander to Moscow at the moment when the one was handing over to the other. Sir Arthur Tedder has been working in the closest touch with General Auchinleck, and so could give the Russian staff a true picture of the situation. It would seem probable that he went to Moscow as a representative of the Middle East rather than of the R.A.F., but that, of course, is only conjecture.

TROPICALISED SPITFIRE: A cannon-armed Spitfire V operating from an airfield in the Western Desert. On August 19th a squadron of Spitfires, patrolling over El Alamein, engaged 20 enemy fighters, shot down four and damaged others without loss to themselves.

U.S. Army Air Force in Action

THE American Army Air Force in Britain made its first independent raid last week—a daylight raid by Fortresses on the docks at Rouen. The arrangement is that though the R.A.F. and the U.S. Air Force may raid independently or in combination, each shall always know what the other is doing. In this case R.A.F. Spitfires provided the escort for the U.S. bombers, while in diversion raids elsewhere in France R.A.F. bombers were protected by squadrons of American fighters. Numbers of U.S. fighter squadrons are using Spitfires, which is a convenience and an economy of effort, but the U.S. bomber squadrons intend to stick to their own types of aircraft, with which, so General Spaatz has said, they are well satisfied. It is, no doubt, fortunate that the British (including their continental allies) and the Americans each prefer their own types of bombers. The Rouen raid was very successful.

That night Bomber Command visited Osnabrück again and dropped over 50,000 fire-bombs. German raids on Britain continued to be sporadic and on a small scale, but most of them have caused a few casualties, and some of the raiders often fall victims to our fighters.

Not much has been heard in the past about the Brazilian Air Force, but lately it has been out hunting hard for the U-boats which have been sinking Brazilian ships. Most of the types used are American, but the Republic possesses some Fairey Gordons.

The Russians have been fighting desperately in critical battles, and fighting with a strategic purpose always kept well in mind. To this strategic purpose all tactical considerations have been subordinated, and some of the Russian losses have been bitter. The Germans have been bombing the Black Sea ports which still remain in Russian hands, and claim to have sunk some supply ships. At the other end of the line, the Russians up in the north have found time to do some bombing of towns in East Prussia, e.g. Danzig, Königsberg, and Tilsit, without losing any machines. Large fires were started in all of them.

DAUNTLESS, UNDAUNTED DOUBTLESS: A Douglas SBD-3 (Dauntless) dive-bomber landing on an American aircraft carrier after being badly shot up by the Japs. The decks of American carriers are of teak and sunk into them are lines of hooks for securing picketed aircraft.

In the Solomons

A LITTLE more news has emerged about the American and Australian attack on the Solomons and the operations related thereto. It has been admitted that H.M.A.S. *Canberra*, a 10,000-ton cruiser, has been lost, but most of the ship's company were rescued. There were 193 casualties, of which 109 were wounded.

The U.S. Navy Department has issued an interesting statement, saying that Marines are mopping up the remnants of the Japanese forces on the islands recently captured in the Solomon archipelago. The word "captured" is very cheering. An enemy cruiser or destroyer was bombed and set on fire by U.S. aircraft. The Japanese must be running very short of cruisers by now. However, a few days before that happened, 24 heavy Japanese bombers made a raid on Port Moresby which did some damage and caused some casualties, but naturally details have not been published. We must all possess our souls in patience until it is safe for Gen. MacArthur to let us know all that has been happening in the Solomons; but the indications are of a hopeful nature. Com-

WAR IN THE AIR

ENEMY AIR LOSSES TO AUGUST 22nd

	Over G.B.	Over Continent	Middle East
Aug. 16	0	0	9
" 17	1	4	
" 18	0	2	
" 19	2	93	4
" 20	1	2	0
" 21	0	0	7
" 22	2	0	0
	6	101	20

Totals: West, 6,275; Middle East, over 4,443.

STILL A FIRE-EATER: The Prime Minister with Gen. Auchinleck on arrival at a Western Desert airfield. Mr. Churchill first saw service in Egypt forty-four years ago with the Nile Expeditionary Force. He rode with the 21st Lancers in their famous charge in the Battle of Omdurman.

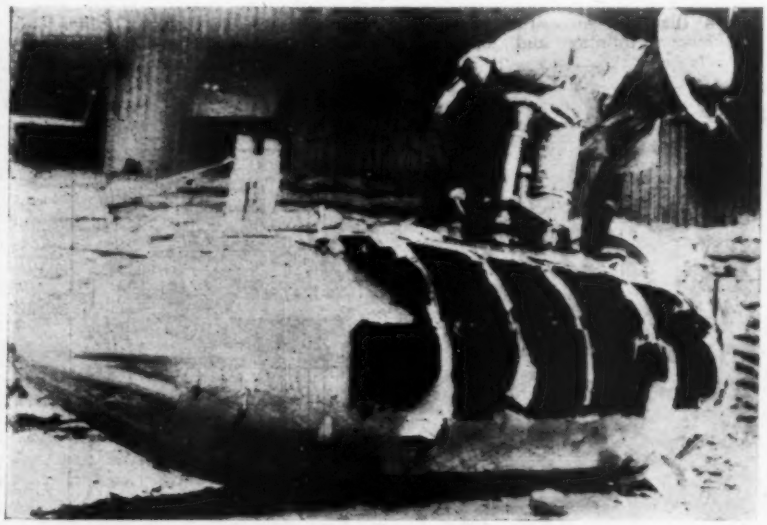
plete success in those operations may have very far-reaching results.

The Dieppe Raid

THE raid on Dieppe was a magnificent example of co-operation between the three Services. The Air Force part in it was under the command of Air Marshal T. L. Leigh-Mallory, of Fighter Command. Under him were units of all the operational Commands. His main business was to provide a fighter umbrella over the ships and the troops, while at the same time bombers and fighter-bombers attacked gun positions on the ground, and Mustangs of Army Co-operation Command kept an eye on everything that happened, and sent back a string of invaluable reports about the progress of affairs.

The work of the fighter umbrella was simply magnificent. An Air Force officer on one of the destroyers said that for the first three hours of the raid (which lasted nine hours in all) he did not see a single enemy aircraft. The units of the Navy and Army went about their business little hampered by the attentions of the *Luftwaffe*. But the Germans were prodded into fighting on a large scale, and the air battle overhead grew more intense than any which occurred during the Battle of Britain. The Spitfires held the ring overhead, while Hurricane bombers, Bostons and Blenheims attacked ground targets, and when necessary the light bombers laid smoke screens.

With splendid organisation, which reflects the greatest credit on the staff work, fighter squadrons kept on relieving each other all day, while the ground crews on the home stations laboured with enthusiasm to refuel, reload, and repair those which came home, and sent them off again. Pretty well all the nations of our Allies (except, of course, Russia) were represented in the Spitfire force. The squadron which shot down most of the enemy was Polish, and its pilots claimed nine, five of them being Fw. 190s. A squadron of Norwegians came second with a score of seven. The actual certain victories of our men have been assessed at 93, of which 47 were Fw.190s, 3 Me.109s, 29 Do.217s, 9 Do.88s, and 5 He.111s, but about twice that number of enemy machines were damaged, and probably a very large proportion of them were actually destroyed. We lost 98 machines in all, 95 fighters and Mustangs and three bombers, but 30 fighter pilots were saved. We shall be on the modest side if we compute that the German air strength in France has been diminished, for some time at least, by some 250 machines.



UNDERSLUNG OVERLOAD: One of the wooden auxiliary fuel tanks carried by the Japanese Zero fighters to give extra range. Cheap and light, they are jettisoned when empty.

New B.M.W. Engine

THE B.M.W. 801 14-cylinder double-row air-cooled engine was described in *Flight* of August 13th. German and neutral reports confirm that a later version, the B.M.W. 802, of 18 cylinders and approximately 2,000 h.p., is also in production. While details and specifications are not given, it is reported that the Fw.190 fighter will be one of the first machines to be equipped with the new engine. It will be remembered that the Fw.190s now in employment by the *Luftwaffe* are powered by the 14-cylinder B.M.W. 801, but from this report it can be assumed that the new engine has been kept pretty well within the dimensions of the 801.

Great trouble has apparently been taken in the preparation of the new type, and production has been organised on the lines of quantity production of automobile engines.

BRITISH AIR LOSSES TO AUGUST 22nd

	Over G.B. A'crft.	Over Continent B'brs.	Over Continent F'trs.	Middle East A'crft.
Aug. 16	0	0	1	0
" 17	0	5	2	18
" 18	0	4	3	0
" 19	0	98 aircraft		0
" 20	0	0	1	0
" 21	0	0	0	7
" 22	0	0	4	0
	0	118 aircraft		25
	—	(30 pilots safe)		(4 pilots safe)

Totals: West, 4,503; Middle East, about 1,596.

HERE AND THERE

Pilot Training Scheme

THREE HUNDRED AND FORTY Indian cadets under the pilot training scheme were posted for training in 1940-41. Of these 244 completed the course and 241 were taken into the Indian Air Force—209 as pilots and 32 as observers.

In February, 1941, the scheme for training aircraft mechanics started with the intention of training 2,000 mechanics yearly for two years at a cost of £446,000.

So far, 2,308 trainees have been posted to training centres. Of these about 800 have been absorbed by the Indian Air Force, 100 by civil industry and about 600 are still under training.

Petrol Used on Engine Tests

THE possibility of putting the horse-power developed by aircraft engines on test to useful work in producing electricity, suggested a short time ago by Mr. Geoffrey Smith, managing editor of *Flight* and *Aircraft Production*, was the subject of a recent question in the House by Mr. A. Edwards, who asked the Minister of Aircraft Production if he was aware that not less than 38,000 gallons of aviation spirit was used daily on aircraft engine tests; and also to what extent steps had been taken by his department to convert this into electrical energy, "thereby avoiding the complete waste of valuable fuel"?

Col. Llewellin replied that, while he did not accept the consumption figure set out in the question, it was a fact that large quantities of fuel were used, and experimental plants had already been laid down for the purpose mentioned.

A.T.C. Cadets in R.A.F. Camps

AIR CHIEF MARSHAL SIR ARTHUR LONGMORE, former Air Chief in the Middle East, has been carrying out a ten days' flying tour of 16 R.A.F. stations where A.T.C. cadets of the North East Region are now at their summer training camps.

Altogether, during the next few weeks, some 30,000 cadets representing 210 A.T.C. squadrons in Yorkshire, Durham and Northumberland, will be spending a week with the R.A.F. Many of the camps are at active operational stations; and besides getting the usual lectures, practical instruction, physical training and games the young airmen of to-morrow will be in close touch with the air and ground crews of to-day. Flights in operational type aircraft—not, of course, against the enemy!—are also being arranged.

Post-war Prospect

PROPHECY that when the war is over "flivver" planes would be the vogue instead of automobiles was made by Capt. A. A. Nicholson, New York oil company executive, in an interview in Toronto.

"The possibilities of plane transportation have not yet been realised," he said. "I have seen millions of dollars of war materials waiting for shipment on the eastern seaboard. Aircraft could solve the problem.

Movie Technicians Needed

FORTHCOMING pictures scheduled for production by the R.A.F. Film Unit's Pinewood studios, have created a demand for a big increase in film production technicians. Already many members of the R.A.F. and W.A.A.F. are engaged on making a celluloid record of the air war in addition to feature and documentary films.

The big need at the moment is for W.A.A.F. negative cutters. But sound recording engineers, cameramen and other technical staff are also in demand. Volunteers are being specially enlisted into the W.A.A.F. and R.A.F. for these duties, provided they have had previous experience of the work in civil life.

These new entrants are eligible for promotion to the rank of sergeant as soon as they have successfully passed the preliminary training and subsequent trade tests.

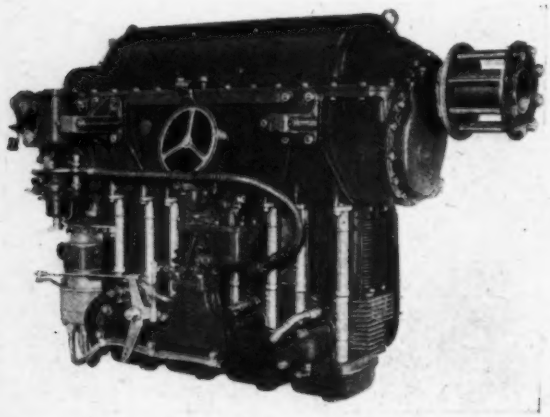
SYMBOLIC: A pilot of R.A.F. Atlantic Ferry Command appraises a grimly playful cartoon sketched on the door of the Hudson he has just flown over from Canada.

Fair Exchange

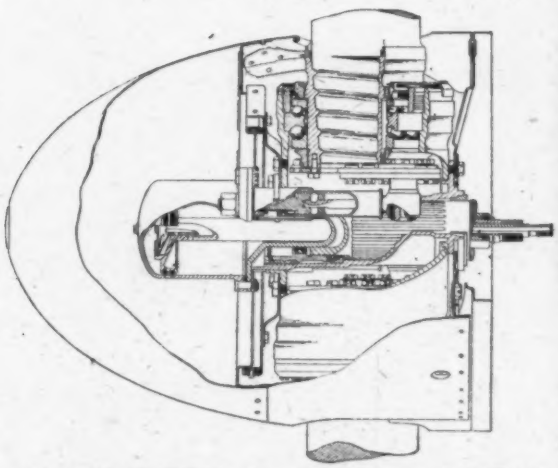
IN those parts of the country where U.S. Army Air Force units are living cheek-by-jowl with the R.A.F. it seems that one of the minor amusements is that of learning each others' "slanguage," or so a member of *Flight* editorial staff reports after a visit to such a station.

Tough Texans may be heard describing something as a "good show," while such expressions as "swell" and "dandy" may already be occasionally heard in the R.A.F. anteroom.

When the Yankee pilots are calling their aircraft "kites," and the boys in light blue refer to theirs as "ships," we imagine the deal will be complete, but they haven't "gotten around" to that yet.



SCREENED HARNESS is fitted to the ignition system of this 90 h.p. Cirrus air-cooled inverted 4-cyl. engine which powers the Taylorcraft trainers used by the Army Co-operation Command of the R.A.F.



ALSO FOR TRAINERS: A sectional diagram of the Rotol fully-feathering two-bladed airscrew for trainer aircraft which was described in *Flight*, on July 30th.

AIR SCENES IN RUSSIA

Some Pictures of Various Activities of the Russian Air Force

A conference between the flying crew and a paratroop officer before taking off on the twin-engined P.S.84 troop carrier in the background.

One of the M.B.R.2 flying boats used by the Black Sea Fleet. An M.34 liquid-cooled Vee engine of 850 h.p. is fitted. Top speed is 155 m.p.h.

At the presentation of the Standard of the Guards to the 12th Russian Fighter Regiment. In the background are their M.I.G.3 single-seat fighter-bombers.

(Above) S.B.2 bombers of the Russian Air Force taking off from a snow-covered airfield for night operations.

(Right) White-clad, airborne troops with their automatic rifles disembark at the double from a P.S.84 troop carrier.

FOCKE-WULF Fw.190

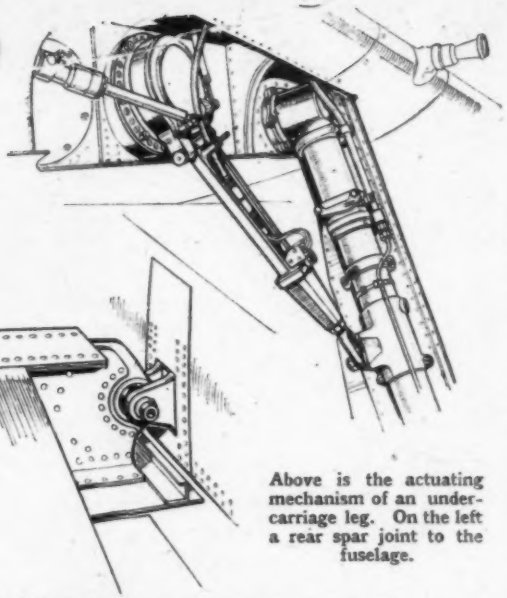
Details of Structural Design : Accessibility in Spite of Crowding

THE details of the Focke-Wulf Fw.190 given in our issue of August 13th can now be supplemented by sketches obtained by our artists during a more recent inspection of the machine which was forced down intact on the South Coast some weeks ago by our fighters. These sketches reveal most of the essential features of the airframe and equipment, and serve to show that it may truly be said that the Fw.190 was literally designed around the engine and armament.

Reference has been made previously to the close cowling of the B.M.W. 801 D14 engine. The crowding of equipment has not, however, been allowed to interfere unduly with accessibility, for when the engine cowling is removed all parts, leads, etc., likely to need attention are exposed. The back of the engine *is* inaccessible, but few accessories are carried there. Removal of the engine is easy, as the whole unit comes away after undoing five attachment points, and the oil tank and cooler are part of the engine unit, with the result that all pipes are very short, and the engine can be tested very readily on a stand for the proper functioning of the lubrication system.

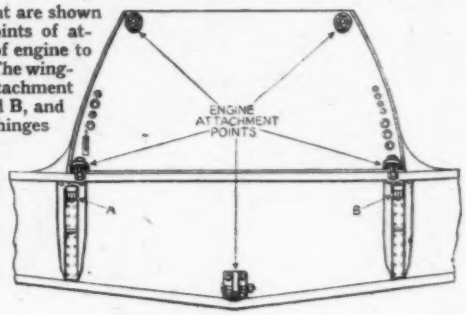
The wing is in one piece, so that repairs of a damaged part are none too easy ; but, on the other hand, the wing can be very quickly removed by undoing four bolts, and a new wing substituted. Virtually of single-spar construction, the wing has a cranked front main spar, which allows the wheels to retract into the leading edge and fuselage in front of the spar. The spar has two plate webs and L-section flanges. The rear spar is hinged to a cross-member in the fuselage. Channel-section formers and Z-section stringers of normal type are used in the fuselage structure. Both wing and fuselage are of straightforward construction, and most of the man-hours appear to have been put into the engine unit.

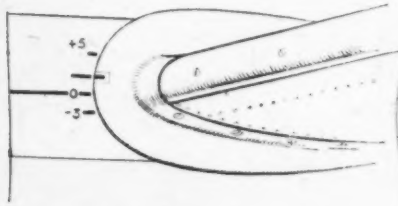
In connection with the controls, it is interesting to find that no tabs are fitted, but merely small adjustable plates

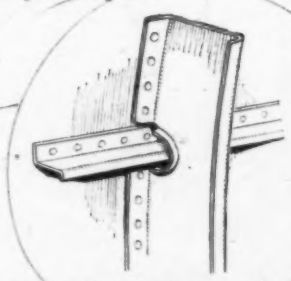


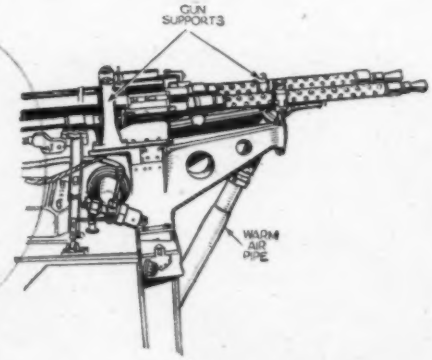
Above is the actuating mechanism of an undercarriage leg. On the left a rear spar joint to the fuselage.

On the right are shown the five points of attachment of engine to airframe. The wing-fuselage attachment is at A and B, and at the two hinges of the rear spars.

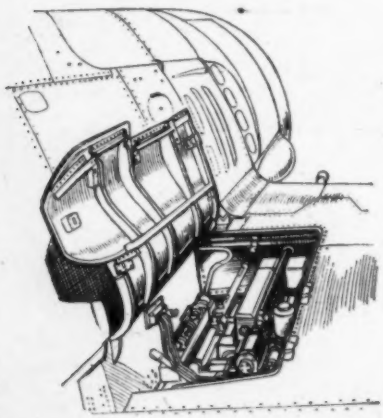


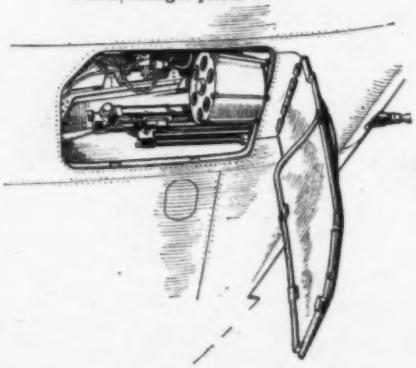


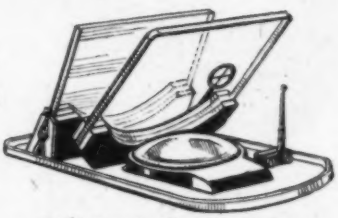




The tailplane incidence gauge (left), and a typical fuselage frame/stringer joint.



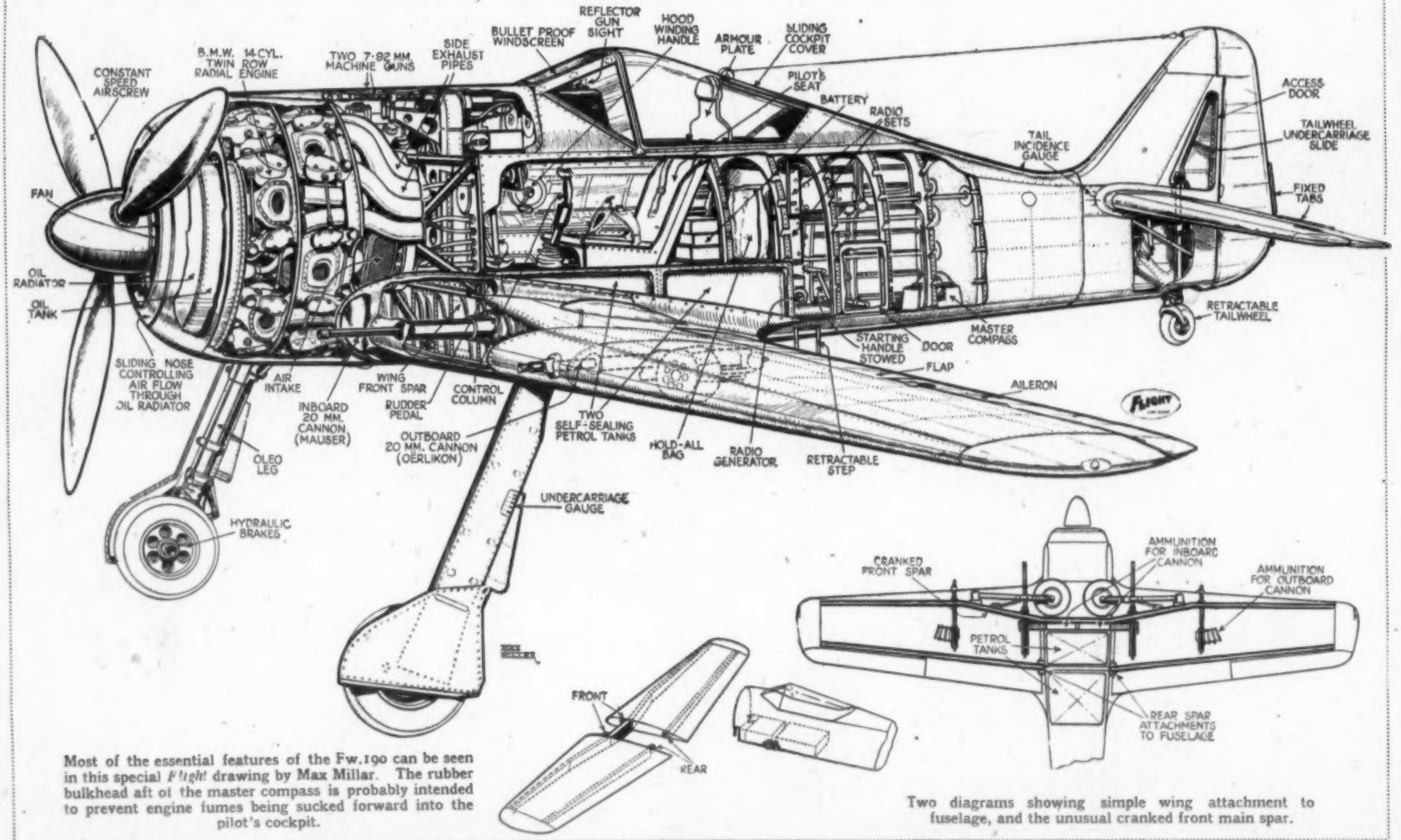




The inboard and outboard cannon are shown on the left, the fuselage-mounted machine guns above. The small sketch shows the reflector sight, the front panel of which is of tinted glass, adjustable by the pilot.

FOCKE-WULF Fw.190.A.3 SINGLE-SEAT FIGHTER

1,700 h.p. B.M.W. 801D RADIAL ENGINE

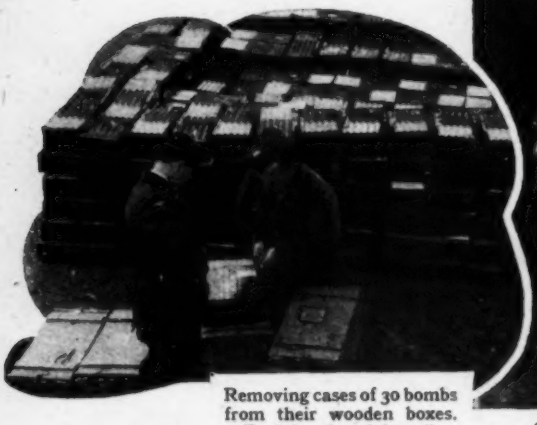


Most of the essential features of the Fw.190 can be seen in this special *Flight* drawing by Max Millar. The rubber bulkhead aft of the master compass is probably intended to prevent engine fumes being sucked forward into the pilot's cockpit.

Two diagrams showing simple wing attachment to fuselage, and the unusual cranked front main spar.

FIRE BOMBS

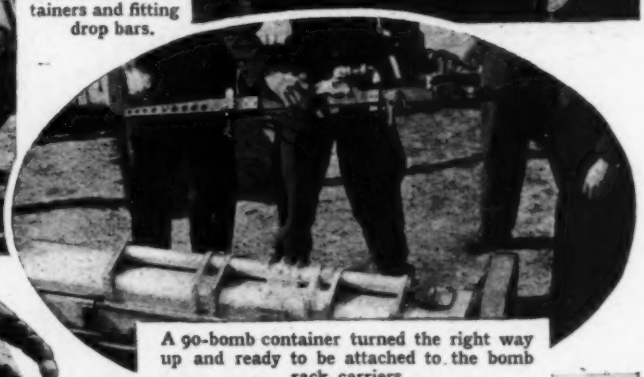
A Series of Photographs Showing how Large Numbers of Incendiary Bombs are Prepared for the Big Fire Raids now Carried out over Germany



Removing cases of 30 bombs from their wooden boxes. Each bomb weighs 4 lb.

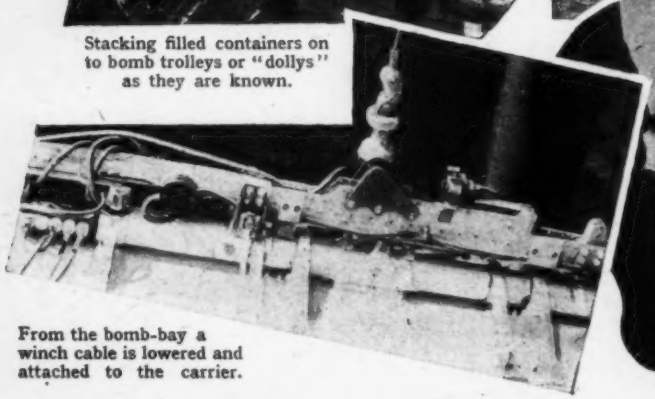
(Top and right) Putting the cases into bomb containers and fitting drop bars.

Attaching the lifting cradle for handling on the ground.



A 90-bomb container turned the right way up and ready to be attached to the bomb rack carriers.

Stacking filled containers on to bomb trolleys or "dollys" as they are known.



From the bomb-bay a winch cable is lowered and attached to the carrier.

When a train of bomb trolleys is ready it goes off to the waiting aircraft.

A hand winch inside the aircraft winds the container — which weighs over 300 lb. — up into the bomb bay.

X-ray field-service laboratory towed by a car to a Lockheed Lightning P-38 fighter for an assumed diagnosis.

MOBILE X-RAY LABORATORY

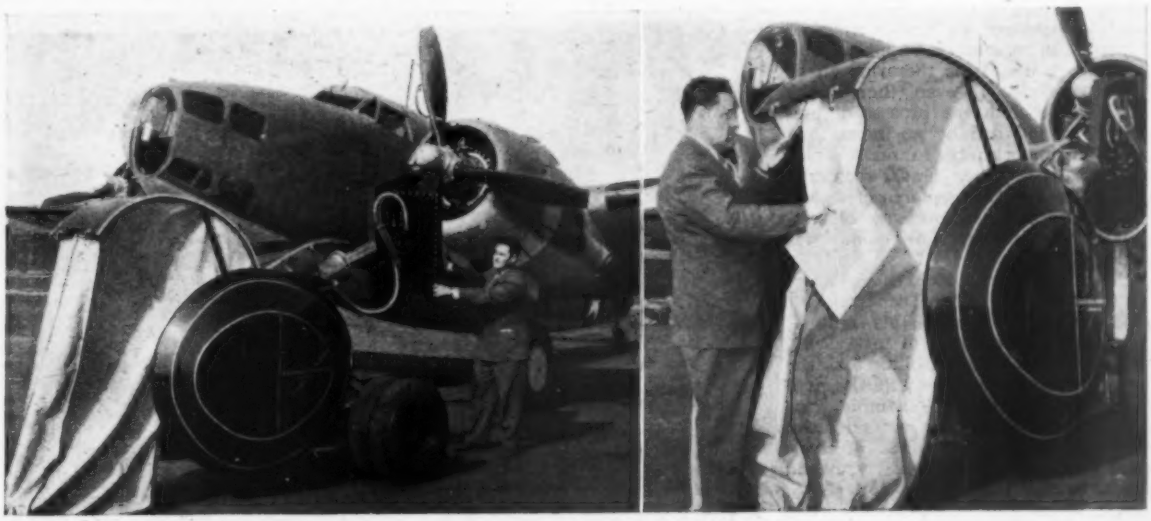
Trailer Unit for U.S. Army Air Forces : Complete Diagnosis on the Spot

PARTS of a military aircraft can now be X-rayed and completely diagnosed for structural weakness right on the airfield within a quarter of an hour after the aircraft lands. This is made possible by means of a mobile laboratory which is being supplied to the United States Air Forces by the Lockheed Aircraft Corp.

Such an examination reveals whether an undercarriage assembly, an airscrew blade or other part has been strained in service and developed an invisible flaw, or is in safe condition for the aircraft to be flown immediately without need of making a replacement or repairs. X-ray photographs are taken without removal of the part from the aircraft and are developed on the spot.

This laboratory, designed and patented by Tom Triplett, of the Triplett and Barton Laboratories at the Lockheed plant, is a self-contained unit built on a two-wheeled trailer and is designed to be hauled by a motor car or truck at a normal speed of 45 m.p.h. on smooth ground or over rough ground at less speed on dual tyres. It has an overall length of 13ft. 4in., a width of 5ft. 2in., and a height of 5ft. 10in. when closed for travelling, and weighs 4,000 lb.

The unique oval body houses hydraulic mechanism for operating a telescopic boom and a yoke which carry the X-ray machine. The boom can be rotated on its axis through 360 deg. and the yoke moved up and down through



(Left) X-raying an airscrew blade. The X-ray machine is carried in a yoke at the end of a telescopic boom and can be moved up and down and rotated by hydraulic mechanism in the trailer. (Right) Plates are developed in 12 minutes in the curtained dark-room built in the trailer.

MOBILE X-RAY LABORATORY

a distance of 6ft., and advanced or retracted 16in. by means of the hydraulic mechanism, so that negatives can be taken of any crucial part of an aircraft *in situ*. The X-ray machine accommodates plates up to 14 × 17in. in size, has automatic control, and is operated by one man, who merely starts it for an exposure of a set time, at the end of which period the machine stops itself.

The trailer body also has a hinged front-quarter top section to which is attached a lightproof curtain which, when pulled out with the top raised, forms a plate-developing darkroom. Behind this curtain within the trailer is a developing tank with trays and a supply of chemical solutions and water. An X-ray exposure requires only one to two minutes, and the negative can be developed and fixed in 12 minutes.

The laboratory, with wheels removed, may be used in a hangar for routine examination of parts, and can be remounted on the wheels in 15 minutes. Therefore, the pilot of an incoming aircraft can radio to the airfield before landing, asking for X-ray service, and within half an hour after landing can know whether or not it will be safe to take off again at once.

TO KEEP 'EM FLYING

American Service Depot for U.S. Army Aircraft in Britain

WITH units of the U.S. Army Air Forces established in Britain and fighting side by side with the R.A.F. in operations against Germany and over enemy-occupied territory across the English Channel, the prompt establishment of Service depots for the maintenance and repair of their aircraft was an obvious necessity.

Flight recently had an opportunity of visiting one of these stations of the U.S. Army Air Forces Service Command, established only a few weeks ago on an airfield taken over from the R.A.F. "Somewhere in England." One of the very first impressions gained was that of quiet, unhurried efficiency.

One large hangar, which had been empty a month previously, was already equipped with orderly rows of drills, lathes and other compact machine tools of a general utility character, ranged along each side of the spacious building and maintained in such spotless condition that one was reminded more of a machine tool exhibition at the B.I.F. than of a Service depot. The U.S. Army clearly knows the value of cleanliness and tidiness in promoting efficiency. Although no actual repair work happened to be going on at that precise moment, one sensed from the atmosphere of the place that when aircraft came in for attention the job would be done quickly and thoroughly but without fuss, to give practical expression to their slogan, "Keep 'em flying."

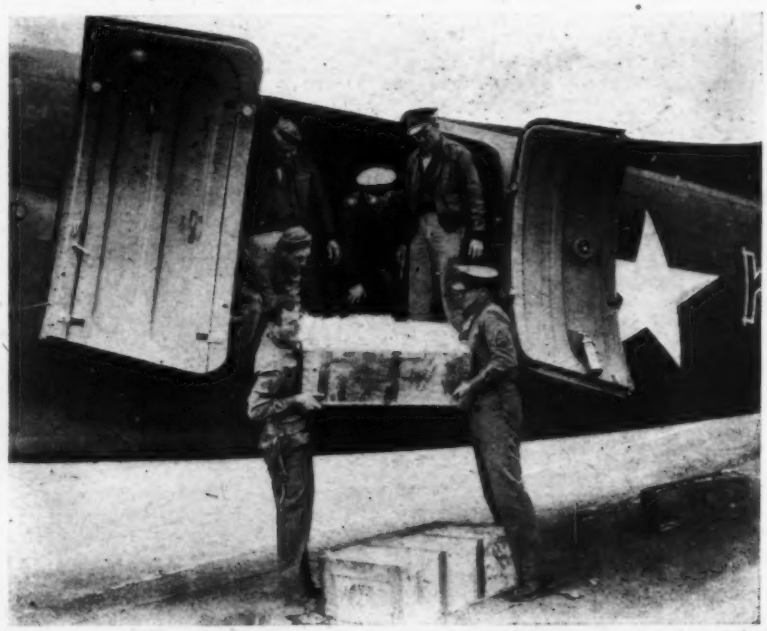
Other hangars at the depot were mainly devoted to the storage of spares and necessary supplies, and here again there was the same air of orderly efficiency, even though the staff was still in the process of preparation, and had by no means had time or opportunity to settle down to a steady routine. Under such conditions, one might have expected, and readily excused, some degree of temporary untidiness, but none was evident.

In one of these store hangars we had a few words with Technical Sgt. Bill Cripps, of Texas (his rank is approximate to that of Flt. Sgt.), whose personal responsibility took the form of some 8,000 classified small parts, including, for example, 300 different types of bolt and no fewer than 1,200 different kinds of rivet. But the slow-voiced Texan, who had been in the U.S. Army for six or seven years, was not the least worried by the range and complexity of the stores in his charge. He explained that he had only been saddled with small quantities of each individual item at first, so that he would have time to lay out the various racks and bins in proper fashion, extending each section as required.

"I'm sure gonna run a hardware store after the war!" he added with a grin.

In another hangar, where larger and heavier items were housed, "roustabout" cranes facilitated handling. Here also we saw two examples of the U.S. equivalent of the R.A.F.'s 60ft. "Queen Mary" breakdown tender.

This particular depot, one of a series being set up in Britain by the U.S. Army Air Force Service Command under Maj. Gen. W. H. Frank, has a total personnel of some 600 officers and men, and the officer commanding this service area is Brig. Gen. Delmar H. Dunton. Such depots will deal exclusively with U.S. Army aircraft, and possess transport aircraft of their own. In this instance we saw four twin-engined transport planes on the airfield, and one which was in process of being equipped as a "flying office" for the use of Maj. Gen. Carl Spaatz, who commands the U.S. Army Air Forces in this country, and who will use it for visiting his various stations.



DOUBLE DOORS: A modified version of a well-known type of twin-engined airliner (name censored) is used as a military transport; note the large detachable panel in the left door which apparently lifts inwards and is probably for the exit of paratroops.

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H.69

Eleventh of the New Recognition Series

AIRCRAFT TYPES AND H

Condor and Liberator

THE original Focke-Wulf "Condor," the Fw.200, was a 26-passenger air liner powered by four B.M.W. 9-cyl. air-cooled radial engines each developing 850 h.p. For military purposes the passengers would be replaced by troops, and, since the comfort of the latter is not considered very much by the Germans, there is little doubt that far more fully-equipped men would be crammed in than the mere removal of the civilian seating arrangements would normally suggest. The official troop capacity, however, is 30 men.

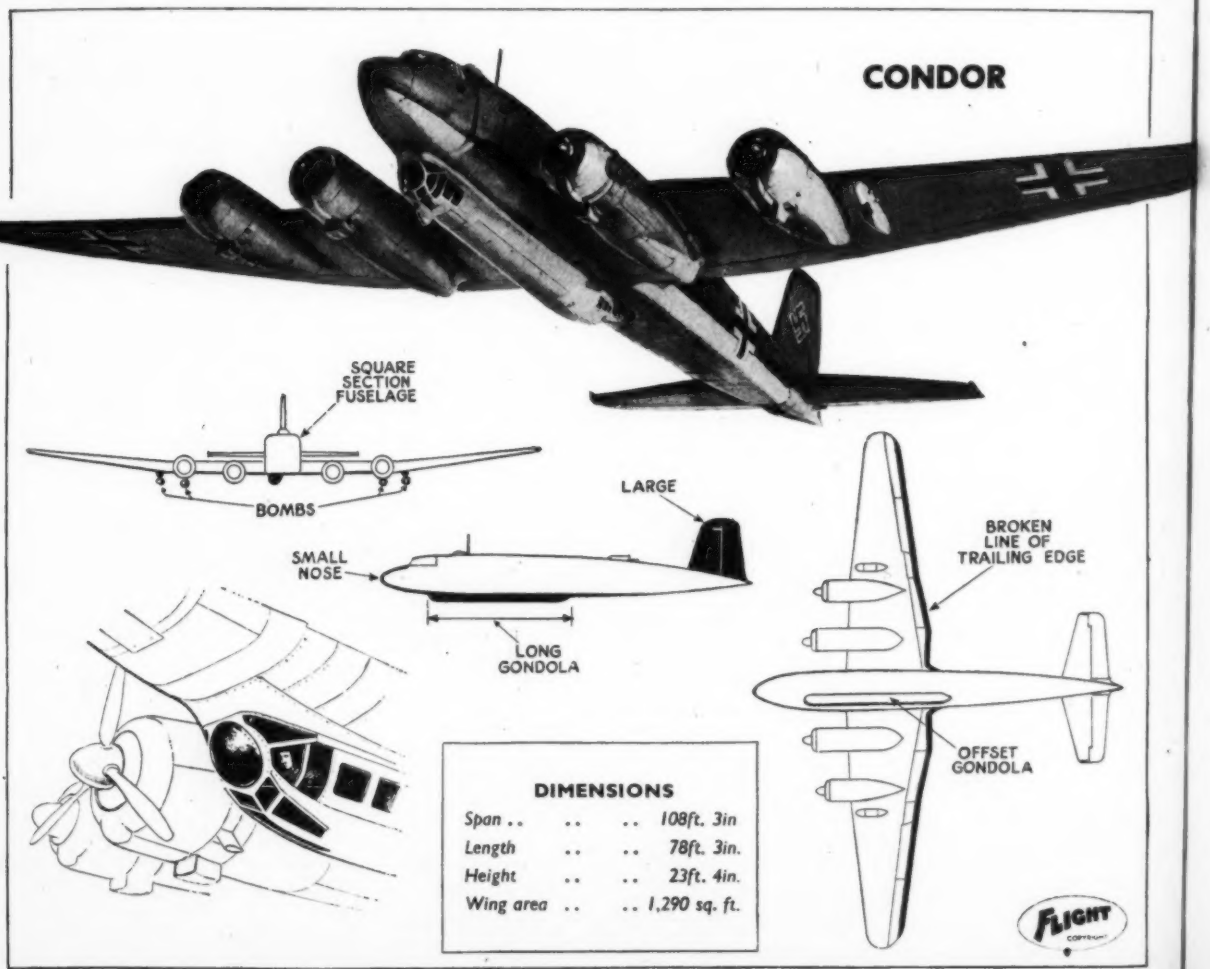
The version illustrated here is the Fw.200K, and the chief modifications comprise the addition of a gondola-like bomb bay beneath the fuselage and slightly offset to starboard; the provision of a gun position amidships above the fuselage; a small power-operated turret above and behind the pilots' cabin, and gun positions in the front and rear of the gondola. The forward gun in the gondola is usually a 20 mm. cannon, but the others are invariably 7.9 mm. machine guns.

When it first made its appearance during the present war the Fw.200K was named the "Kurier," but more recently it seems to have become customary to apply the old name of "Condor" to the later models which are widely used for attacking Allied convoys in the Atlantic and for long-range oversea reconnaissance and mine-laying. This version of the Condor formerly had Bramo-Fafnir 323 air-cooled radial engines of approximately the same power as the B.M.W.s, but there is now also a K2 version fitted with the new B.M.W. 801 engine of 1,320 h.p., and heavier armament, the precise disposition of which cannot be stated with certainty; in any case it probably varies from time to time.

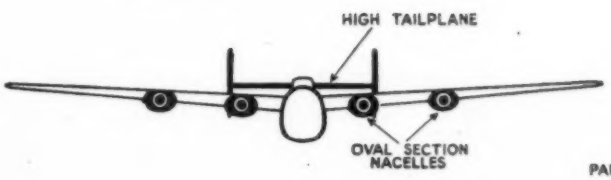
The top speed of the Bramo-Fafnir engined Condor is quoted as 250 m.p.h. at 13,120ft., but that of the Fw.200K2 is increased to 279 m.p.h. at 18,100ft. The former's cruising speed is about 180 m.p.h. at sea-level as against the 224 m.p.h. at 19,700ft. of the latter, and its service ceiling 21,500ft., compared with 28,850ft. But the maximum range of the K2 appears to be slightly less at 2,300 miles compared with the former's 2,430 miles.

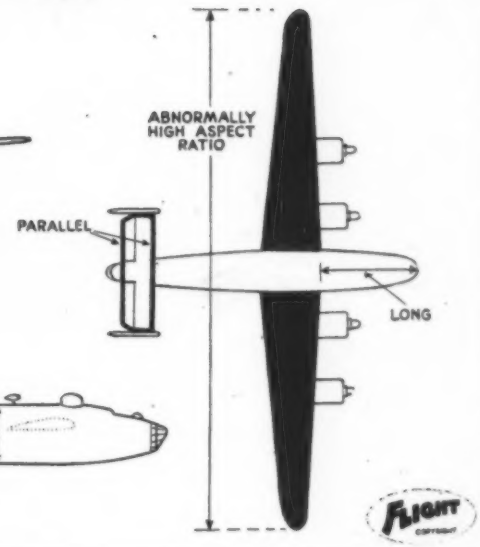
Constructionally the Condor remains just the same, the fuselage being an all-metal monocoque with stressed-skin covering, the low, cantilever wings each comprising a single main spar with two auxiliary spars.

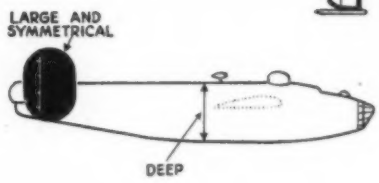
Like the fuselage, wings and tail are covered with smooth metal covering except for the control surfaces, which are fabric covered. Slotted ailerons and split trailing-edge flaps are fitted. Twin wheels are employed on the undercarriage, and important details from the spotter's point of view are the familiar kink in the trailing-edge of the wings, the large, angular, low aspect-ratio single fin and rudder, the small, beak-like nose, and the offset bomb gondola.



HEIR CHARACTERISTICS







DIMENSIONS

Span	110ft.
Length	63ft.
Height	19ft.
Wing area ..	1,050 sq. ft.

THE most important difference (especially to the crews) between the Liberator I and the Liberator II is the latter's vastly improved armament, which is equal to that of British-built bombers. Quantity production of the latest type of the Consolidated four-engined bomber is in full swing in a number of American factories as part of the general scheme involving a vast system of sub-contracting not unlike our own shadow factory scheme. Approximately half the output under this scheme are Liberator IIs and half Boeing Flying Fortress IIs. The earlier deliveries of the Liberator I are used mainly on the Atlantic ferry service, where their limited defensive armament does not expose them to any undue risks.

All-metal construction with light alloy stressed-skin, flush-riveted covering is employed throughout, with the usual exception of fabric-covered control surfaces. The fuselage is a monocoque structure and the wings are of the multi-spar type. The latter employ the now celebrated Davis aerofoil of abnormally thin section for which 25 per cent. less drag is claimed in comparison with more normal types. From the spotter's angle, the chief point about the wings of the Liberator is their very high aspect-ratio, their span of 110ft. being the greatest of any bomber at present in service with the R.A.F.

As the Consolidated concern concentrated formerly on flying boats—the Liberator being their first big land bomber—it is natural that much of their flying-boat experience has been built into the latter, and certain features are distinctly unusual, notably the outwardly retracting undercarriage which, attached beneath the inner engine nacelles, raises the wheels into recesses in the centre-section between the two nacelles on each wing. A nosewheel provides the up-to-date tricycle undercarriage arrangement.

Power is provided by four Pratt and Whitney Twin-Wasp 14-cyl. radial engines each of 1,200 h.p., carried in underslung nacelles with oval cowlings whose flat sides are set horizontally. Top speed is 335 m.p.h. at 16,000ft., cruising speed 230 m.p.h., service ceiling 36,000ft., and the range at cruising speed approximately 3,000 miles. The maximum loaded weight is 41,000 lb., and the bomb load is quoted at 8,000 lb. The crew carried varies from six to nine according to requirements.

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AIR PHOTOGRAPHY IN WAR

Development of the R.A.F.'s F.24 Camera : Wide Variety of Duties : Mid-air Processing : The Cine-Camera Gun

By GROUP CAPT. F. C. V. LAWS, O.B.E.

THE aim of air photography in war is to obtain accurate information and to present it as clearly and quickly as possible. Ministers, Admirals, Generals and Air Marshals anxiously await photographs that will tell of the enemy's movements and which will enable plans to be made for his destruction.

Day by day and night by night the work goes on, for cameras are the untiring eyes of fighter and bomber alike; theirs is the eagle's view from 40,000 ft.—or perhaps that of the seagull, skimming the mast-head to bear witness to another enemy cargo sent to the bottom.

Great numbers of photographs are brought back from flights, and when systematically "interpreted" by experts are the most important source of information about the enemy's activities. Though a single photograph may show an accumulation of tanks in a village, the progress of a shipbuilding yard or fortification must be followed by a carefully planned series of photographs extending over weeks or even months, and taken often in the face of adverse weather conditions and enemy opposition.

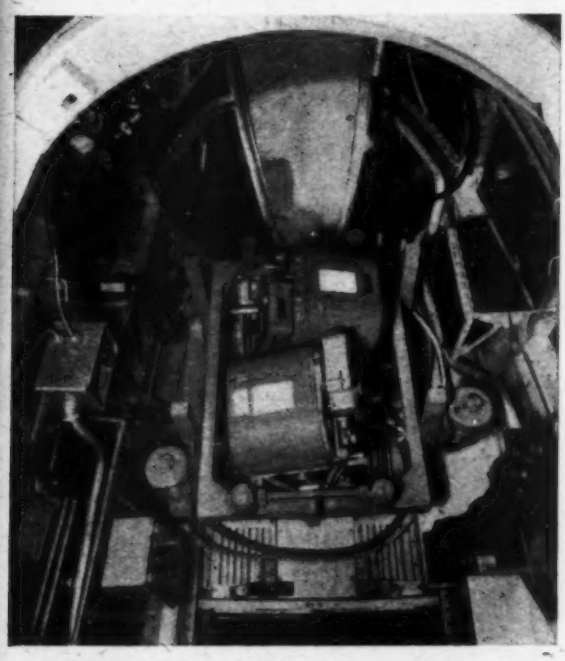
Photography plays a large part on every front, and behind the vast but little noticed organisation that makes this possible lies a long story of progress and endeavour.

Air photography is already a veteran, having given much good service in the war of 1914-1918. The first air photographs were taken by observers who used ordinary cameras and leant over the side of their open aircraft to get records of the enemy ground dispositions in trench warfare. The development of special air cameras was slow at first, but once the possibilities were recognised the effort was intensified until at length the F.24 was produced by the R.A.F. This was an efficient and reliable instrument at the outbreak of the present world war.

Group Capt. Laws, who is Deputy Director of Photography, Air Ministry, has been closely associated with Service air photography since it was first introduced into the Royal Flying Corps in 1912. Many important developments may be traced to his untiring efforts.

In the development of this camera attention has been paid to the prime necessity of automatic operation and control, so that series of photographs could be taken at predetermined intervals and large areas covered with the greatest accuracy. Thus from the beginning of the present war we had a sufficient number of suitable cameras, and could start immediately on the reconnaissance of enemy territory.

However, the requirements of modern warfare are legion, and the "straight" F.24 reconnaissance camera soon became merely the foundation upon which most of the later developments were based. The constant call for improvements soon proved how right the experts had been when they designed the F.24 on a "Unit" system—each section self-contained and easily interchangeable. Thus, if a large capacity magazine were required for special reconnaissance, only the magazine had to be built; or if a faster shutter was needed, then only the shutter blind had to be replaced. The first question asked when a new type of photography is required is, how can the F.24 be adapted?



An installation of twin F.24 film cameras mounted obliquely in such manner as to cover twice the field of a single camera.

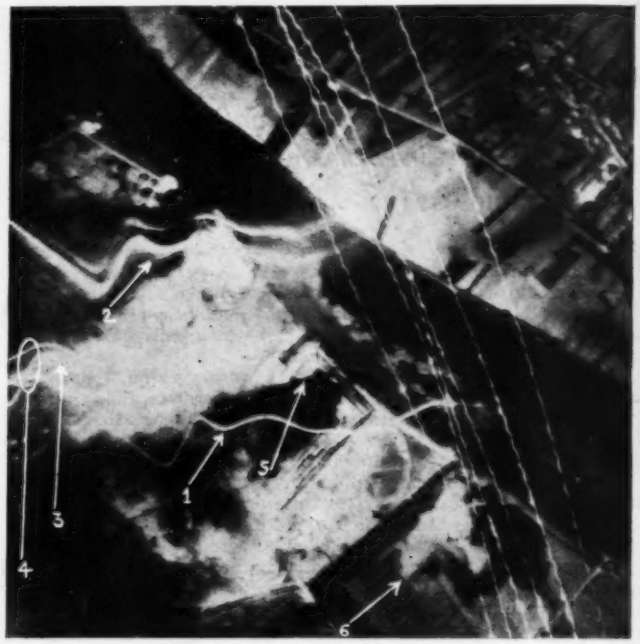
Check on Raids

Apart from the production of equipment, there has been the equally important problem of recruiting and training of R.A.F. photographers. Fortunately, the R.A.F. found a ready response to the call for recruits. Amongst those who joined were many skilled amateurs and not a few professionals of life-long experience. Aided by the specialised training of the R.A.F. schools of photography their knowledge has proved invaluable, for it is only by the skill and experience of trained men that the new equipment can be maintained and used to the best advantage. Members of the W.A.A.F. are also proving very successful in photographic work.

The uses of air photography in war are legion; I can describe only a few of the more important. Bomber Command is concerned with locating the target and recording the actual attack, so that success may be established beyond doubt. Since vast areas are covered, the checking of targets is a colossal task, but it must be carefully carried out so that the crews may be shown, before they leave the ground, exactly what the target looks like, even when highly camouflaged. Photography is also a regular part of the bombing routine. The camera, automatically operated by the bomb-release switch, takes a complete run of photographs of the whole bombing operation. Photography is not restricted to day bombing only, for by the

AIR PHOTOGRAPHY IN WAR

aid of a powerful flash bomb and the ever-adaptable F.24, the results of our night attacks can often be checked in every detail. We know where every aircraft dropped its bombs, and in many cases we can spot the actual bomb bursts. It is rarely possible, however, to get sufficient detail in a night photograph for actual damage assessment; this must be left to the reconnaissance aircraft which will follow up next day. The information obtained enables the Air Ministry to issue a bulletin like this: "Severe damage to the biggest assembly shop of the Heinkel Aircraft Works is revealed by the latest picture taken of Rostock after its four nights of sustained attack by the R.A.F."



Photography by flash-bomb and open-plate method of a night raid on Matford Works. 1, 2 and 3 are tracks of fires burning on the target. 4, muzzle flame and tracer from a light anti-aircraft gun; 5, track of searchlight; 6, smoke from explosion of bomb.

From All Heights

In daylight reconnaissance Coastal Command may need photographs to identify and locate the positions of enemy shipping. The navigator is considerably aided in this work by still another adaptation of the F.24. A "while-you-wait" developing unit is built into his camera and he can get a picture of the target within two minutes of making an exposure.

Bomber and Coastal Commands also require records of low-level bombing attacks, sometimes not more than 50 feet from the ground. From this height a vertical shot, even with a wide-angle lens, would cover only a very small area, and the great speed of the aircraft would result in a very blurred picture such as you see from a fast-moving train when another and equally fast one is going the other way. The difficulty has been overcome by attaching a mirror to the lens. This mirror is set at 45 degrees to the lens axis, and when directed backwards under the tail of the aircraft, will secure a picture of the target that has just been attacked.

The photographers of the R.A.F. are located in various parts of the war zones. Their jobs may range from a single photograph of a railway siding to 1,000 photographs mapping an entirely uncharted territory. Their headquarters may be either a train of mobile dark rooms in the field or a specially planned building at the home base.

The camera equipment ranges from F.24's with 3½ in. lens and 5 in. by 5 in. negative to F.8's and F.52's with their special 40 in. telephotos covering negatives 8½ in. by 7 in. In peactime air survey could be carried out in an orderly and leisurely manner by floating up and down the area to be surveyed at heights such as 5,000 feet and speeds of some 120 miles an hour. But such risks can hardly be taken in wartime, and flying speeds are more likely to be in the neighbourhood of 300 miles an hour. As for the ceiling, it has been raised to nearly 40,000 feet, and it is from these great altitudes that the long-focus lenses are used to produce photographs of the necessary scale.

Direct hits on the target recorded when a daylight attack was made on Matford Motor Works at Poissy, Paris. The photograph was taken by an F.24, with a mirror attachment as shown on the opposite page, projecting aft through the floor of one of the attacking aircraft.

At these great heights our aircraft penetrate far into enemy territory, where they photograph whole districts in broad daylight, remaining invisible to the enemy so long as they avoid those particular altitudes where the tell-tale condensation trail will give them away.

Automatic Processing

Reconnaissance photography is carried out on such a large scale that hand processing and printing is impracticable. Only automatic machines are capable of handling the hundreds of negatives and thousands of prints that are required every day. In fact, the processing unit is not unlike that of a motion picture laboratory. It handles great lengths of film, and the latest sensitometric methods are used to ensure results of the highest possible quality.

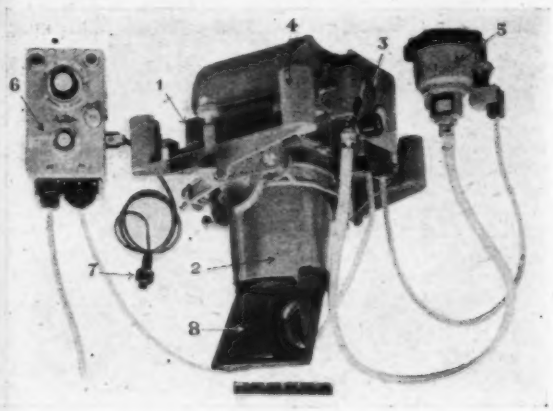
The Army also has co-operation reconnaissance personnel who are the

eyes of the Army in warfare, and are always on the watch for enemy movements. Speed is of vital importance if the best use is to be made of this information, and special processing sections are pushed up as closely as possible to the actual front line. Magazines are dropped by parachute to avoid landing delay, and a special rapid processing equipment is installed—so that the Interpretation Officer may get prints within ten minutes of the magazine arriving in the processing section. This special processing is done in a spiral type processing tank, and the technique involves the use of highly concentrated solutions, which give adequate development in 1¼ min. The negatives are printed wet on specially prepared paper.

Standard Camera

Perhaps one of the most interesting applications of photography in the R.A.F. is the use of the cine-camera gun for recording actual aerial combat and for training fighter pilots. When used in actual combat these cameras provide incontestable proof of enemy aircraft being shot to pieces, and many extracts have been included as "highlights" in films for release to the public.

The cine-camera gun uses 16 mm. film, and is mounted in the aircraft as a "fixed" or "free" gun, to be used in addition to the other guns when in action, or in place of an actual gun during practice. It is automatically started with the depression of the gun-firing switch and "shoots" a series of pictures of the target plane which serve to record its position relative to the attacker. It has



An F.24 camera fitted with a 45 deg. mirror attachment and accessories. (1) Body. (2) 8in. lens and cone. (3) Gearbox. (4) 125 exposure magazine. (5) Driving motor. (6) T.35 control (modified to give 2-second intervals). (7) Operating switch. (8) Mirror attachment. (9) Type 25 camera mounting.

largely replaced the "towed target" as a means of training fighter pilots, since it provides not only much more realistic combat conditions, but also makes a record of the "near misses."

It has been stated that R.A.F. aircraft cameras are built on a unit system which readily lends itself to modification for special types of photography and ensures freedom for maintenance and repair. Some idea of how the system works may be gained by taking the F.24 camera as an example. The basic camera is built up of six units:—

1. *The body.* This houses the shutter, and to it are attached the other units.
2. *The focal plane shutter.* The three interchangeable blinds have different slit widths and variable tensions, giving a range of exposure from 1/100th-1/1,000th sec.
3. *The gearbox.* This contains the mechanism for releasing the shutter, winding on the film, and resetting the shutter—an operation which takes just over a second.
4. *The lens and cone.* Five types of lens are employed, ranging from the 3¼in. f/5.6 extra wide angle lens to the 20in. f/5.6 telephoto. (The standard cone contains the 8in. f/2.9 lens.)
5. *The magazine.* The two types supplied are of 125 and 250 exposure capacity. The camera gives a negative 5in. square.
6. *Camera mounting.* This is specially designed to allow the camera to be levelled in the air and kept free from vibration of the aircraft.

The Universal Night Camera is an adapted F.24, fitted with an exposing blind of special type—that is, with a width of slit equal to the negative size, thus permitting a "time" exposure. An unexposed section of film will be brought into position over the lens, and will remain exposed until the control winds it over again. This control is a special "Type 35," which is pre-set to expose a fresh section of film five seconds before the flash is due to explode, and to wind on this section five seconds after the explosion has taken place. The exposures obtained in this way will show a certain degree of movement, and also traces of fires on the ground, searchlights, and anti-aircraft fire. However, as night raids are usually carried out from great heights, the advantage gained by using the whole of the flash will compensate for the disadvantages entailed, and prints may be obtained which are not only sufficiently sharp to permit the location of the aircraft at the moment of exposure, but which also show the exact location of the bomb bursts.

Many night operations take place at comparatively low levels, at which a faster exposure is necessary. For such cases the F.24 has been further modified as the F.24 Mark 1A, in which a built-in Louvre shutter is actuated by a photo-electric attachment on the side of the cone. The shutter is opened by the Control five seconds before the flash is due to explode, and is closed at the "peak" of the flash by the photo-electric attachment. This "peak" is reached in 1/60th second, but most of the light has already done its work and will produce an image sufficiently sharp for ship recognition at heights up to nearly 10,000 feet.

"While You Wait"

In certain cases it is necessary to get results "on the spot," so that "position" or some particular target may be identified before leaving the area. In this case it is true in the strictly literal sense that the experts have "provided the solution"—for they have designed a special processing unit which can be incorporated in the camera magazine.

The magazine so modified is the larger 250 exposure type, in which much of the space normally occupied by the large roll of film is occupied by two stainless steel tanks containing jellied processing solutions. A short length of film is loaded into a light-tight cassette and threaded through the magazine for exposure in the normal manner. The film is then fed on to a slow-speed sprocket system which takes it through the processing tanks, through a squeegee, and out through the case of the magazine, which is fitted with a guillotine cutter. *A developed and stabilised negative is fed out of the camera in approximately two minutes from the time of exposure.*

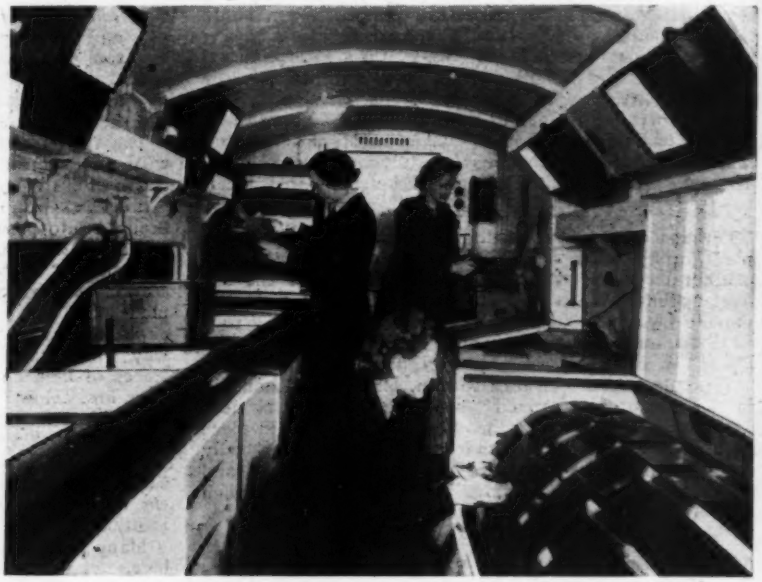
These, then, are some of the requirements of operational air photography in the R.A.F. The less spectacular but equally important aspect is the business of camera installation and maintenance, and the processing and printing of the films. Cameras have to work for long hours under the most severe conditions, and even the slightest unchecked fault may ruin a whole reconnaissance.

This is where the R.A.F. photographer comes in. Aircraft cameras are installed and adjusted to work on the "robot" principle. When the pilot or bomb-aimer presses a button, the rest can be safely left to "T.35"—that ingenious control which can start a whole series of operations—from a 500-exposure reconnaissance requiring exposures at regular intervals, to the synchronisation of the flash

AIR PHOTOGRAPHY IN WAR

explosion with the actual bomb bursts during a night raid.

Most people who have used a camera will know how important it is to estimate the right exposure. This, again, is a job for the photographer, who must calculate and "set" the exposure before the aircraft leaves the ground, for it is generally impossible to make alterations in flight. The problem of estimating exposures is much more difficult in aerial photography than in ground work. The problems do not arise to any great extent from the type of subject or from the weather, for at high altitudes the weather is very much the same the world over, and all subjects are alike. The chief problem lies in the fact that the exposures are usually made hundreds of miles away from the base, and many hours after the cameras have been set. When it is remembered that light varies with time of day and period of the year, and also with latitude and longitude, it will be seen that there are a good many factors to be thought of.



Interior of a photographic trailer with W.A.A.F. photographers at work in the printing room. The trailer is a completely self-contained developing and printing unit with its own hot and cold water system and air-conditioning plant.

Exposure tables of a sort were available at the outbreak of war, but, as the scope of operations widened, special tables were worked out based on service data which covered the whole globe. Copies of these tables are to be seen in every section, and are used in conjunction with the pilot's reconnaissance report, which contains the necessary meteorological information and the anticipated time and duration of the period over the target. With these data it is nearly always possible to make an accurate assessment of the exposure.

Photo Map-making

On his return from the sortie, the pilot records the actual conditions under which the exposures were made in the photographic reconnaissance report, so that on further reference to the exposure tables the photographer can check their accuracy from actual experience. Under adverse weather conditions, or when avoiding action has caused delay, the resultant errors in exposure can still be partially corrected by giving the film special processing treatment for known under- or over-exposure.

Processing in the R.A.F. has been highly standardised, and is entirely carried out by the time-temperature method. By this means it is possible to produce uniformly high quality even in processing individual spools of film from day to day. On the small sections, which handle only short lengths of film, the spool developing unit is still employed, and fresh developer is used for each spool to ensure that no loss of quality results from stale or partially exhausted developer.

A small army of photo finishers, airmen and W.A.A.F.s, are kept busy day and night turning out the prints for the various intelligence branches. Here, again, it is vital that quality shall be maintained. The intelligence officers are mainly concerned with microscopic detail in shadows and high lights, and if photography is to play its part none of this must be lost. On small sections this work is done by expert photographers, but on larger sections machinery has again been brought into play, and automatic printing machines capable of handling up to 600 prints an hour keep pace with the ever-growing demand for more and more pictures.

Although most of the requirements of the intelligence branches are fulfilled by contact prints from the negatives, map-making to scale requires accurately scaled enlargements of matched quality which can be mounted together to form a composite picture of a whole district. Even in peacetime and when flying conditions are ideal, the task is a tricky one, but in wartime, when the pictures may have been taken by different aircraft flying at different heights, the task imposes the most searching tests on the skill and patience of the photographer, and much depends on the personal care and attention which he bestows on his ground work.

But since they know the great personal risks which the air crew have taken to bring back the photographs, sometimes with the grisly reminder of a camera full of bullet holes, the technical staff consider no pains too great to extract the last ounce of value from the negatives; and when they compare shots "before and after," and note the accurate destruction to which their work has contributed, theirs, too, is the grim satisfaction that they are pulling their weight in the war.

Non-photographic Heat-reflecting Paint

PAINT that reflects heat rays but not light rays is being applied to the roofs of its new buses and coaches by the White Motor Co. in the United States as a camouflage material. The American Transit Association is also reported to have recommended that the tops of all street cars (trams) and buses be painted with material of this type so that they cannot be readily seen or photographed from an aircraft in flight either by day or at night.

Paint of this kind, as developed by the Arco Company, of Cleveland, Ohio, is lustreless olive-drab in colour and reflects rays of wave-lengths longer than those of visible rays, such as heat and infra-red rays. It is suitable not only for camouflaging army trucks, tanks, ordnance and aircraft in wartime but also for insulating motor coaches, buses, trams and railway cars against heat transmission in peacetime.

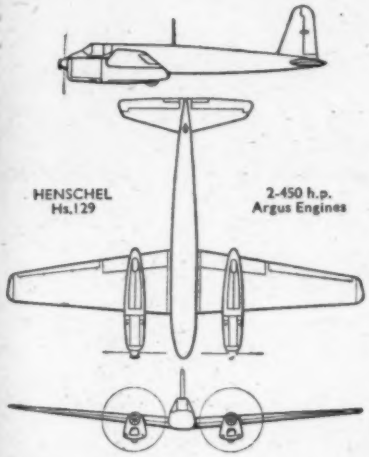
The British Government undoubtedly is familiar with this type of material, which is believed to be the kind used on aircraft of the air forces to make them nearly invisible in the beams of enemy searchlights.

BEHIND THE LINES

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

A New Henschel

THE Henschel and Sohn Co., of Kassel, the well known German engineering firm, which is controlled by members of the Henschel family, has now been reinforced by the appointment to its board of directors of Dr. G. Stieler von Heydekamp. It is interesting to know that the latter is a member of the board of the Opel Automobile Company and a director of the Opel truck and lorry works, previously known as "Brennabor."



Reports from neutral sources state now that the Henschel aircraft works at Schoenfeld, Berlin, have completed the production of a new twin-engined low-wing monoplane, the Henschel, Hs129. The aircraft has a span of 50ft., length 38ft., gross weight of about 9,000lb., and maximum speed at sea level of 225 m.p.h. It is powered with two Argus As410 air-cooled in-line engines of 450 h.p. each, and its armament is reported to consist of two cannons and four machine guns in the fuselage nose.

The Henschel Hs.129 is to be employed for close-support work, and is well armoured on the underside of the fuselage.

Axis Rockets

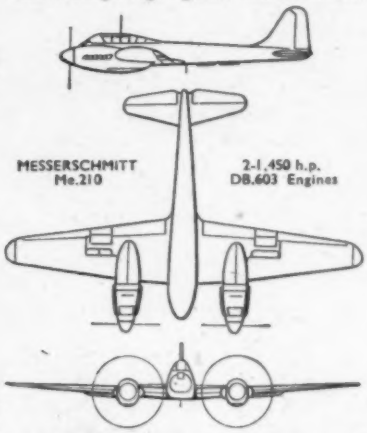
FRENCH sources report that Axis aircraft used for operations against British convoys in the Mediterranean are equipped with rocket bombs for low flying attack. The device employed is similar to that used by the Russians on their Stormovik fighter-bomber.

Danish Rubber

A FIRM engaged on the production of cattle fodder, "The Danish Soya Bean Cake Manufacturers," has produced a rubber product marketed under the name of Aetylan. This is the only synthetic rubber produced in Denmark, and it is claimed that it has good resistance against oil and petrol. For the time being Aetylan is to be used only for rubber soles and conveyor belts, but the manufacturers hope to adopt it for the needs of aircraft.

Me.210

IT is expected that the Messerschmitt Me210, the new German twin-engine fighter-bomber, will soon come into wider employment by the *Luftwaffe*. The aircraft, which is of the German "Destroyer" type, will probably be used as long-range fighter, bomber escort,



and possibly for night fighting and night bombing. It is powered with two DB 603 engines of 1,450 h.p. The new aircraft has a relatively short fuselage nose receding behind the airscrew hubs, and in contrast to the Me110, a single rudder unit. Dimensions differ slightly from those of the Me110: span 52.5ft., length 36.3ft., gross weight 18,100lb. The Me210 carries a crew of two and is said to have an armament composed of two cannon and four machine guns, or alternatively four 15 mm. guns in the wings and two synchronised machine guns in the nose of the fuselage.

Neutral reports giving the above specifications state that the aircraft has a much better range than the Me110 and a very high bomb-load of about 4,400lb. (?!). Its maximum speed is 285 m.p.h. at 18,400ft.

Flying Boat of Wood

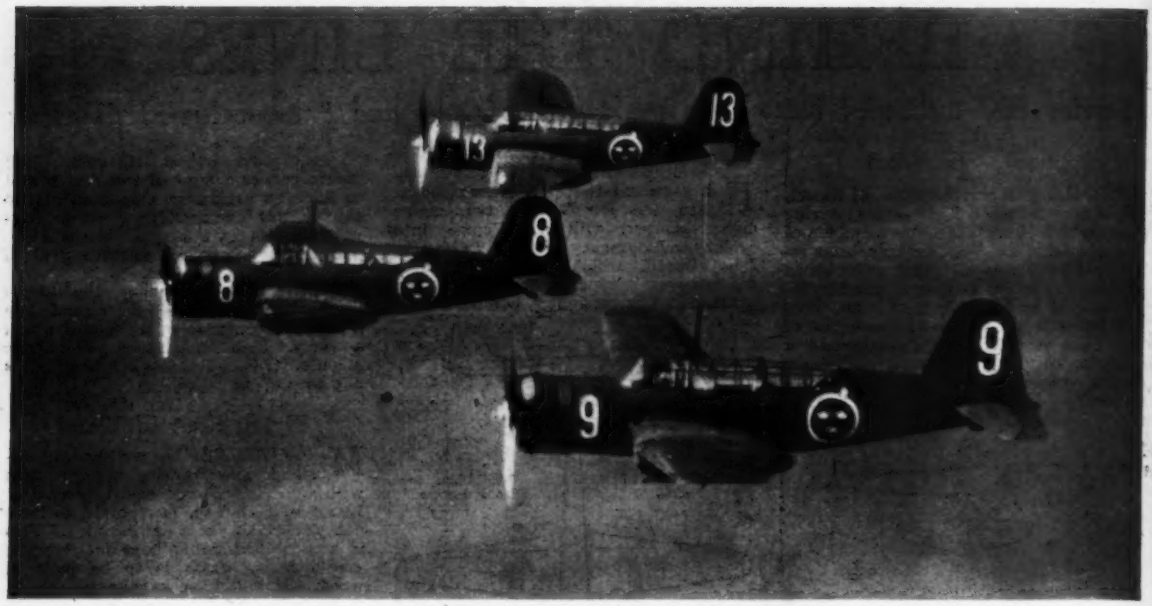
M. GALTIER, the well-known designer now working in connection with the Vichy Aeronautical Arsenal at Lyons-Villeurbanne, is reported to have completed plans of a new aircraft. This is a 4-engined flying boat for Atlantic employment, which is to be built in wood. It will have a span of 138 ft. and a gross weight of 60,000lb.

Yasuda for Japs

LIEUTENANT GENERAL TAKEO YASUDA has been appointed Chief of the Japanese Army Air Staff. General Yasuda is 54 years old, and was, until recently, head of the research centre of the Army Air Force (Rikugun Koku Gijutsu Kenjyujyo) at Tachikawa, near Tokyo.

Incidentally, this appointment is connected with the new trend in the organisation of Japan's Air Force, which is designed to give the Army Air Force a wider autonomy.

INSIDE VIEW: This photo shows the arrangement of the instrument panel of the Me.109. Reading from left to right and starting from the top row the instruments are as follows:—1, Clock; 2, Bracket for reflector sight; 3, Magneto switches; 4, Altimeter; 5, Magnetic compass; 6, Boost gauge; 7, Air speed indicator; 8, Bank and turn indicator; 9, Airscrew pitch control; 10, Rev. counter; 11, Airscrew pitch indicator; 12, Oil pressure; 13, Undercarriage indicator; 14, Handle for undercarriage control; 15, Fuel supply control; 16, Control box for armament and electric loading; 17, Fuel contents gauge; 18, Oil temp.; 19, Water temp.; 20, Control stick with a protected firing button on top; 21, Tube of the high altitude equipment.



AT AN "AIR FORCE DAY": A flight of Swedish B17's.

SWEDEN'S AIR POWER

The Growing Air Strength, Industrial Resources, Equipment and Organisation of the Air Force

By V. L. GRUBERG

UNTIL the outbreak of this war Sweden enjoyed an uninterrupted period of peace for about 130 years. German aggression and the subsequent military operations on the Scandinavian Peninsula have rudely disturbed the tranquillity of the country. Although not actively drawn into the combat, Sweden found herself surrounded by violent changes brought forth by the war, and had to find ways and means to readjust herself to these new conditions.

Strictly observing her neutral status, Sweden took the view that the strengthening of her defences was the best guarantee for the preservation of her neutrality. By 1940 the Coalition Government embarked upon a programme of substantial expansion and modernisation of her armed forces, and particularly so of the air force. In pursuance of this policy, far-reaching measures were adopted to build up an air force which would be commensurate to Sweden's needs. This meant starting almost from scratch, for while Sweden certainly had a nucleus of an air force, neither the equipment nor the number of personnel were in any proportion to the country's needs, as envisaged by the policy of "strong neutrality."

It has been suggested that because of the high standard of nutrition, peaceful development and sporting activities of their youth, the resources of suitable potential flying personnel are higher in Scandinavia than anywhere else. This is certainly an important factor in the Swedish endeavour to build up their air power. But the human potential would be useless without suitable training and without the provision of suitable types of aircraft in adequate quantities.

The standard of training of the Swedish air force is built on methods developed from British and German experience, and is certainly very high. So far as equipment is concerned it was hitherto mainly of foreign origin. With increased transport difficulties, political complications involved in purchases from belligerents and the priority necessarily given by them for their war needs, Sweden had to turn to the domestic industry to furnish the equipment for her expanding air force. This was greatly facilitated by the existence of a substantial mechanical and armament industry and by the available resources of mechanical skill.

For years Sweden's armament industry enjoyed an international reputation and produced some of the world's finest weapons. The production of automatic weapons is based on an old-established industry such as the famous Bofors A.B. or the Husqvarna Arms Works, which in 1941 achieved a record output higher by 35 per cent. than that of 1940. The products of Sweden's arms and mechanical industry were in pre-war days exported to practically all parts of the world, from South America to Afghanistan. To-day the main efforts of this industry are directed towards

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supplying the needs of the country's defence forces.

The material resources necessary for the expansion of the aircraft industry are sufficient to cope with the demands for increased output. The efficiency of metal production is further enhanced by the continued concentration of the industry and the pooling of resources and research facilities. Thus the Svenska Metallverken of Vaesterås combined with the Finspongs Metallverken A.B., and these two biggest light-metal producers in Sweden have at their disposal up-to-date plants and highly skilled personnel.

Expansion of the Metal Production

The shortage of some metals has caused restrictions in their use for civilian consumption and most of the metal-producing plants have been directed to work for the Government's armament programme. Firms like the Svenska Metallverken, Vaesterås and the Sandviken Steel Works are turning over their output to the needs of the munition industry. The Svenska Aluminium Company A.B. was reported to be establishing two new plants at Kubikenborg (North Sweden) at a cost of 5,000,000 kr. The Bolinder-Munktell Metallurgical and Engineering Company constructed a big plant which can be considered the most up-to-date underground installation. But more than any other branch of metallurgical production, the local light-metal industry is in a state of unprecedented expansion owing to the increased demands of the growing aircraft industry.

The necessity to rely increasingly on local resources of material and plant facilities, coupled with the scarcity of some consumer goods, has been responsible for the introduction of government control immediately upon the outbreak of war. Shortly after the outbreak of this war the government established control of almost all raw materials. But with the increased production of military equipment, intensified farming and the increased output of timber to replace coal, a certain shortage of man power was felt.

In 1942 the production of armaments and of various necessary substitutes has been further intensified, and increased call-ups of men for military service has added a further drain on Sweden's resources of man power. An even stricter control of economy is therefore likely to set in to release man power from non-essential industry to such branches of production as are engaged on the fulfilment of the rearmament programme.

The production of suitable aircraft engines was one of the most serious deterrents of Swedish efforts to rebuild air power. In other branches of strategic production Sweden had ample experience and plants, but not so in the case of aircraft engines. Moreover, the absolute impossibility of purchases abroad made this a most serious problem. The policy embarked upon, and which has already yielded very satisfying results, was to pool the local resources of skill and technical experience accumulated in the automotive industry. The Volvo Company, known the world over for its products, has stepped in and acquired the controlling interest of the "Nohab" Engine Co. (since changed into Svenska Flygmotor A.B.) and of other engine works. With the view of further expansion this company has recently doubled its share capital; the new issue being taken up by Volvo and Bofors. Between them the two latter companies own 62.5 per cent. and 32.5 per cent. respectively of the Svenska Flygmotor firm.

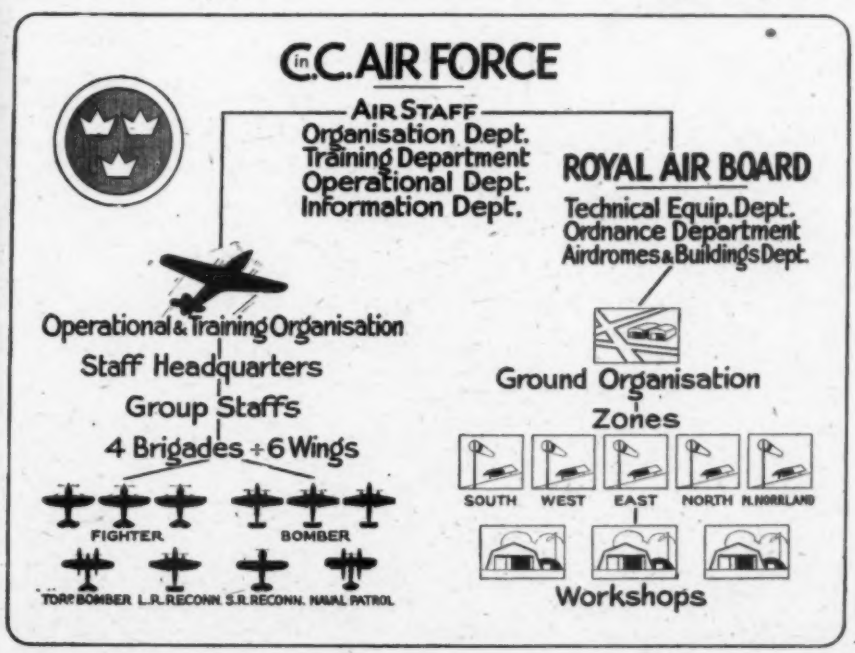
At present, this concentration of the aircraft engine industry has led to a unified control of four plants for aircraft engines and parts: (1) The Svenska Flygmotor Works at Trollhättan; (2) The Volvo Works at Göteborg; (3) Volvo Branch Works at Skovde; (4) a new plant at Ulvsunda, near Stockholm. The Svenska Flygmotor Works at Trollhättan are entirely self contained, using domestic material and producing their own castings, forgings, etc. Bristol "Mercury" and Pegasus engines, and Hamilton v.p. airscrews have for some time been in production in this plant.

The Production of Aircraft

As in the case of the production of aircraft engines, the policy of the government applied to the aircraft industry is to prevent scattering of contracts and to enforce strictest supervision and a far-reaching standardisation of types.

In conformity with this policy the Svenska Aeroplan A.B. was the main supplier of the government's orders. The design department of the A.B. Förenade Flygverkstäder, Stockholm, a company formed in 1937, was merged with the Svenska Aeroplan and gradually a wide joint organisation has been built up. Among others it includes to-day two main plants at Linköping (originally the A.B. Svenska Yärnvagsverkstäderna) and at Trollhättan. The NA-16 Trainer and the Douglas (Northrop) 8A single-engine bomber were produced for the Swedish Air Force at Linköping and the Junkers J-u.86 was built under licence at Trollhättan. A short while ago the A.B. Hägglund och Söner at Oernsköldsvik, a firm of motor body builders, took up the production of aircraft and components.

The Götaverken at Göteborg, one of the country's largest shipbuilders, built at first Hawker "Hart" biplanes, and was for some time engaged on its own designs. Incidentally, this firm was responsible for the design and construction of the "Gotland," Sweden's



The diagram shows the organisation of the Royal Swedish Air Force under the present programme of expansion. Each aircraft symbol in top row stands for 2 flotillas, in bottom row for one.

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first cruiser destined for employment as an aircraft carrier, which carried a number of float seaplanes on a platform over the quarter-deck, and had one catapult forward of the platform.

Finally, mention should be made of the government's aircraft works (Flygvapnets Flygverkstäder Centrala) in Malmslätt and Vaesterås, which have been previously engaged on the construction under licence of some foreign types (Hawker Hart, Fokker C. V-E and the Focke-Wulf "Stieglitz"). These workshops, which are now a part of the air force ground organisation, are now mainly concerned with repairs and maintenance. A third workshop which is being constructed for the air force in Arboga is reported to be an underground installation similar to the Bolinder-Munktell plant mentioned before.

The Swedish Air Force forms part of the armed forces under a General assisted by an Air Staff, a Staff of Defence and a Royal Air Board. The tactical unit is the "grupp" or flight. Two or three of these form a "division" (squadron); normally three divisions constitute a "flotilla" (wing) and two or more flotillas comprise an "eskader" (group).

The Growing Air Force

The Swedish plan for the expansion of defence forces provides also for a considerable strengthening of the air force. For the time being, the air force is to have a strength of 16 first line wings (flotillas), composed of the following branches:—6 bomber, 6 fighter, 1 torpedo-bomber, 1 long-range reconnaissance and 1 short-range reconnaissance, 1 naval patrol bomber wing. A seventeenth fighter wing for naval co-operation is to be formed in 1944. Reporting these plans, the German daily *Hamburger Fremdenblatt* remarks significantly that this is "in present days a very long period. . . ."

As envisaged in the government programme, six new first-line wings will be added to the present strength of twelve, out of which No. 12 Wing is a dive-bomber unit. The new wings are to be distributed in the following manner:—No. 13 fighter wing for Norrköping; No. 14 bomber wing for Halmstad; No. 15 fighter wing for Söderhamn; No. 16 fighter wing for Upsala, No. 17 torpedo-bomber wing for Karlskrona and No. 18 fighter wing for naval co-operation

An inside view of a signals room at a Naval Air Unit.

IN DIVE : A B5 (Northrop 8A-1) two-seater attack bomber powered with a Swedish-built Bristol Pegasus engine of 875 h.p.

The actual intensified training and expansion of the air force is best shown by a comparison of figures of the flying hours for the past few years:—In 1939, 47,311 hr.; in 1940, 85,268 hr. and in the first nine months of 1941 133,660 hr.

The equipment of the Royal Swedish Air Force was composed prior to the war of imported types and aircraft built locally under licence. For training, British, American and German types were used. Bomber squadrons were equipped with Junkers Ju 86K designated in the Swedish Air Force B3, B3A, and B3B; Hawker Harts (B4); Northrop 8A-1 (B5); and Republic 2PA (B6). The fighter units were also flying a variety of British and American machines.

Cosmopolitan Equipment

In 1939 the Swedish government ordered hundreds of Republic EP-1 single-seater fighters; 56 Republic 2PA 2-seater fighter-bombers; and 114 Vultee 48 Vanguard single-seater fighters. The order was ultimately cancelled by the U.S. government for reasons of war priority and only a few types came into service with the Swedish Air Force: the Republic EP-1 single-seater fighter; an export version now named Republic Model 100 and designated by the Swedes J9; and the Republic 2PA two-seater general purpose and dive-bomber, probably experimental types designated B6 in Sweden. Both aircraft are powered with Pratt and Whitney "Twin Wasp" 14-cylinder air-cooled double row radial engines of 1,200 h.p.

Orders were placed in 1939-40 with Germany for 18 Dornier Do 215, 23 Heinkel He 114 and a number of He 115; but according to reliable reports only two He 114 and a quantity of the He 115 were delivered. In the Swedish Air Force the He 115 twin-engined torpedo and reconnaissance seaplane is designated S12 and the Fieseler "Storch" single-engine reconnaissance aircraft are known

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as S14. The equipment of the air force was further supplemented by purchases from Italy of a number of Caproni 313 twin-engine light bombers, 42 single-seater fighters Fiat CR 42 (J11 in Sweden) and Reggiane Re 2000.

The latter (J20 in the Swedish Air Force) is fitted with a Fiat A 80 R.C 41 engine of 1,100 h.p. and carries an armament composed of two large-bore machine guns mounted on the top of the engine and firing through the airscrew arc. The Caproni 313 is used both as a light bomber and is then named B16, or for reconnaissance work under the designation S16. A Swedish designed and produced type B17 or S17 is in service as a dive-bomber or alternatively as a reconnaissance aircraft.

The B17 and the S17 2-seater dive-bomber or 3-seater reconnaissance aircraft type is a cantilever mid-wing monoplane of all-metal monocoque construction, with flush-riveted smooth metal skin, and fabric-covered control surfaces. The undercarriage retracts backwards, and when in the raised position each undercarriage unit is completely enclosed forward of the wheel by a fairing attached to the undercarriage leg, and aft of the wheel by a fixed fairing under the trailing-edge of the centre section.

Alternative equipment is a ski landing gear or twin floats and retractable tail wheel. Both versions of the aircraft are powered by Swedish-built Bristol Pegasus 9-cylinder radial air-cooled engines of 800-1,000 h.p. and drive a Svenska-Hamilton c.p. airscrew. Bombs are carried in the fuselage and retractable bomb-racks are fitted on the underside of the wings.

Recent reports state that the design of a modern fighter aircraft has been completed and a new bomber developed, embodying the latest experience gained in this war.

Domestic Fuel Resources

A.A. defences have also not been neglected. The rearmament plan provides for the establishment of an A.A. Defence Corps (*Luftvarnet*). The A.A. personnel, which has already been doubled, will be further reinforced by the formation of seven new A.A. regiments.

Perhaps the most difficult of the many problems involved in the expansion of the air force is fuel. Before the outbreak of war Sweden covered her requirements in aviation fuel and lubricants in the international market. At the same time efforts were made to secure the products of the shale-oil resources in the North Baltic countries. With the extension of the war zones and the increased difficulties in the imports of oil and aviation fuel, Sweden turned to the exploitation of the domestic resources of shale oil. Although its oil content is rather poor (5 to 6 per cent.) energetic steps were taken to develop the existing resources.

A second plant established this year by the Svenska Oelje A.B., a government-controlled company in Naerke (Central Sweden), has a capacity of about 30,000 tons per annum. The shale oil obtained from this region is of a superior quality, yielding 10 to 15 per cent. petrol, 20 per cent. diesel oil, and 25 per cent. other fuel oil. Experiments have proved that it lends itself extremely well for the manufacture of an excellent aviation fuel. The available resources are reported to be sufficiently large to satisfy Sweden's needs in aviation fuel, should the technical expectations be justified by the actual production.

Thus Sweden tackles all problems connected with the development of her air power. The progress already achieved in this direction is noteworthy and offers good testimony to the skill and efficiency of these efforts. While neither the present strength nor the immediate potential development of the air force can possibly compare with the vast expansion of the air power of belligerent nations, it equips Sweden better to protect her neutral status. There can be no doubt that her growing defensive strength enables her to withstand better and to deal more firmly with the demands or wishes of her Nazi neighbour.

This picture shows the undercarriage unit of the B17 which is covered by a fairing attached to the undercarriage leg and forward of the wheel. The undercarriage retracts backwards and is then enclosed between this and another fairing fixed under the trailing edge of the centre section.

ROYAL REPUBLICANS : The Republic E.P.1 Model 100 single-seater fighter and the Rep. 2-PA Dive Bomber are in service with the Royal Swedish Air Force.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

ASTRO-NAVIGATION

Time Error of 3 min. 55.91 sec.

THE kindergarten simplicity of Lt. Col. Mieville's exposition of the science of astro-navigation would deserve high praise but for the fact, unfortunately for him, that the earth revolves upon its axis once every 23 hours 56 minutes 4.09 seconds and not as stated once every 24 hours of "chronometer" time.

Col. Mieville draws no distinction in his article between solar and sidereal time and some of his statements as they stand are thus both misleading and inaccurate, which is a pity because he makes a good take off.

Thereafter he progressively loses himself at the rate of approximately one degree of longitude every day.

C. B. COLLINS.

GYROSCOPIC CONTROL

First Aircraft Stabiliser in 1909

A CERTAIN amount of publicity has been given to the question of gyroscopic control of aircraft in view of the extension of patents granted to Mr. F. W. Meredith and Mr. P. Cooke by Mr. Justice Simonds recently. In summing up, the learned judge stated that the invention was of such value and importance and in particular that the introduction of such apparatus as the inventors' device really made the crossing of the Atlantic a routine matter instead of an adventure.

I would hasten here to acknowledge very definitely the contributions to gyroscopic control of aircraft given by Messrs. Meredith and Cooke. I am sure also that they would be the first to admit that the Sperry Automatic Pilot was conceived in principle prior to their inventions and that Atlantic flying has been, in practically every case, and most certainly up to the outbreak of war, carried out on Sperry gyropilots. Perhaps a brief history of the development of the Sperry Gyropilot would not be amiss as this stage.

The Sperry Company in America took up the development of an automatic pilot for aircraft at a very early date, and U.S. patents relating to this subject were granted as far back as 1912. Actually the first gyroscopic stabiliser for use in an aircraft was made and installed by Sperry in 1909. In 1914 the Sperry Aeroplane Stabiliser won the first prize at the "Concourse par l'Union pour la Securite en Aeroplane." Four gyroscopes were used at that time for obtaining aileron and elevator control. During the years 1916-1925 numerous patents, both American and British, were taken out. In January, 1923, the Sperry Company interested the Air Ministry in the development and the Air Ministry eventually considered this important and novel enough to acquire the inventions. Among the conditions of purchase was that two complete aircraft provided with the new Sperry Automatic Pilot should be delivered and should satisfactorily carry out performance tests to be imposed by the Air Ministry. In 1924 Sperry delivered the two machines with the automatic pilots, and in 1925 the Air Ministry concluded its agreement with the Sperry Company for the purchase of the invention and the two aircraft and patent rights.

It is clear, therefore, that the detail information concerning the inventions was given to the Air Ministry in 1923, and that the gyroscopic control in automatic stabilising systems for aircraft was then recognised.

I do not in any way infer that the principles used by Messrs. Meredith and Cooke are similar to those used for the Sperry Automatic Pilots, but I do wish to make the point that the pioneering work on gyro stabilising of aircraft was carried out by the Sperry Company.

In 1929 certain patents which Sperry had sold to the Air Ministry were repurchased from them by Sperry, who in 1932 filed U.S. patents covering the type of automatic pilot which was similar to that in general use to-day. The very famous flights of Mr. Wiley Post in the *Winnie Mae*, and Mr. Howard Hughes around the world, were done with early Sperry automatic pilots. Atlantic flying by passenger-carrying aircraft which, prior to the outbreak of war, was coming into its own, through pioneering work of Imperial Airways, Ltd. (carried out to-day by British Overseas Airways Corporation) and that of the Pan-American Airways, was all accomplished with the aid of Sperry automatic pilots. The history of transoceanic and long-distance flying is closely allied to the pioneering work of the Sperry Company in this field.

(For the Sperry Gyroscope Company, Ltd.),
J. VIVIAN HOLMAN, Manager,
Aeronautical Department.

INTERNATIONAL AIR POLICE

Britain and U.S.A. Must Lead

THERE must be many readers of *Flight* who were gratified by the publication of Lord Brabazon's Wilbur Wright Memorial Lecture and, subsequently, of the article by Group Capt. Fulljames. It is probably early but not futile to discuss the idea of an international air police force, and I wish you would now devote equal attention to full reviews of the Seversky and Ziff advocates for air power, which have had so much attention in the lay press. These books would appear to demonstrate beyond a peradventure that ultimate material power is vested in the air.

Failing conversion of the entire world to Theocracy when every man-made law could be automatically abrogated, and the use of police forces, armies, navies and air forces would be a forgotten bad dream, when the sword would really have been beaten into a ploughshare, and when every man would live peaceably with his neighbour with none to make them afraid . . . failing all this, some precaution such as your contributors envisage will have to operate for the instant deterrence of the wrong-doer.

It could, it is true, take the form of an air police force rather like that prophetically, if fancifully, imagined by Rudyard Kipling in his famous story to which Lord Brabazon referred. But just how difficult would be the establishment of such a force will be realised by the reflection that, despite the boasted enlightenment of the modern world, the organisation of education and the growth of knowledge of every kind, it is still as good as impossible to obtain unity of thought, aim or method by the community as a whole upon any simple social project the major concern of that community, or even of one isolated family or a group of people in that community. Individual self-interest predominates all the time and wrecks efficient and sensible action.

How much more impossible is it then to expect to achieve unity of aim in the complex problems, religious, racial, political and economic, which beset larger groups of people involved in nations or empires. Inevitably, if nothing else, dissension due to economic nationalism, working through the present world economic system, would defeat the successful working of any international air police force, as it did of the now defunct League of Nations.

We are not so far, perhaps, from the Kingdom of God on earth as Lord Brabazon would have us believe, but near or far, until we can find for humanity an alternative motive for living wherein service will come before self, certain it is there will be no peace. The "lesser breeds without the Law" will always be liable to run amok. Armed, however, with the world's ultimate weapon for good or ill—air power—one righteous nation or empire can wield it for good and thus save the world from the only-too-well-imaginable horrors of a still future Armageddon.

So we must come back to the Pax Britannica, or shall we say, the Pax Atlantica. Let us have no further truck with international leagues, founded on air power or otherwise, to ensure peace. They have been tried and they have failed. Let us not hurriedly surrender sovereignty or risk further failures in international concert, for Hitlers go and come rather than come and go. Moreover, the ally of to-day may be the foe or neutral of to-morrow. Let us complete our amalgamation with the U.S.A. and rely upon our own strong right arm of air power.

This is plain commonsense and inexorable logic. To lead is our job and destiny, in conjunction with our blood brothers of the U.S.A. and all men of good will in the non-Axis countries who care to join us. Whose job if not ours? So . . . we should aim at emerging from this war so strong in air power that peace will be secure until the advent of the millennium.

H. J. J.

Service Aviation

One of our latest 23,000-ton aircraft carriers, H.M.S. *Formidable* at sea. A Hurricane is on the flying deck just in front of the navigating island.

Royal Air Force and Fleet Air Arm News and Announcements

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy.

DISTINGUISHED SERVICE ORDER

Act. Wing Cdr. E. P. Wells, D.F.C., R.N.Z.A.F.—This officer has completed many operational sorties. He has destroyed eleven, probably destroyed three and damaged many more hostile aircraft. His courage, skill and initiative have proved a source of inspiration to his colleagues and his fine leadership has contributed materially to the many sucesses achieved by the wing.

Wing Cdr. D. O. YOUNG, D.F.C., A.F.C., R.A.F.O., No. 76 Sqn.—This officer is a most resolute, courageous and skilful leader. After seven days' service with another squadron Wing Cdr. Young joined this unit. Six days after his arrival, having had time to fly a Halifax for a few hours only, he led the squadron on a daylight raid on Brest. Twelve days later he repeated his attack on the same target. On three occasions he participated in attacks on the German naval base at Trondheim. Since May, 1941, this officer has taken part in attacks on a wide variety of enemy targets, including Berlin, Cologne, Frankfurt and Essen. Throughout he has displayed devotion to duty of a high order.

Wing Cdr. M. V. Blake, D.F.C., who has received the D.S.O. The official citation appears on this page.

Act. Sqn. Ldr. D. W. HOLFORD, D.F.C., No. 103 Sqn.—This officer is an outstanding captain who performs his duties, both in the air and on the ground, with a thoroughness rarely found. His determination to inflict loss on the enemy is expressed in his desire to participate in sorties at every opportunity.

One day in February daylight operations were ordered at short notice. By his energy and zeal he organised his aircraft crew and so inspired his maintenance crew that he was able to take off within an hour and fifty minutes after the preliminary warning had been received. On numerous occasions Sqn. Ldr. Holford has made three and sometimes four runs over the target to ensure successful bombing or to obtain a photograph. During the past two months this officer has taken part in most of the sorties on which the squadron has been engaged. He is an outstanding leader whose skill and courage have set an inspiring example.

Act. Sqn. Ldr. H. A. H. WATTS, R.A.F.O., No. 101 Sqn.—This officer has displayed outstanding leadership, while his organising ability has been of a high standard. His determination to press home his attacks is conspicuous. His fine operational record includes several attacks against Berlin and other attacks on the majority of the important targets in Germany and German-occupied territory. Sqn. Ldr. Watts is a courageous leader.

Wing Cdr. M. V. BLAKE, D.F.C.—During the past ten months this officer has completed numerous sorties, including several attacks on enemy shipping. He has rendered valuable service and his leadership has been of the highest order. He has destroyed at least nine hostile aircraft.

Act. Wing Cdr. the Hon. M. AITKEN, D.F.C., A.A.F., No. 68 Sqn.—A brilliant pilot and a gallant leader, this officer has set a most inspiring example. By his exceptional skill and unswerving devotion to duty, he has contributed largely to the high standard of operational efficiency of his squadron, and to the successes it has achieved. One night in July the squadron destroyed five hostile aircraft, two of which were destroyed by Wing Cdr. Aitken himself. His total victories number twelve.

BAR TO THE DISTINGUISHED FLYING CROSS

Flt. Lt. L. R. BARR, D.F.C., No. 15 Sqn.—Flt. Lt. Barr was the captain of an aircraft detailed to attack submarine slipways at Lubeck. In adverse weather, and in the face of strong enemy ground defences, he vigorously attacked the target from an extremely low level, although his aircraft had been hit many times by shell fire. This officer is an extremely cool and courageous captain whose persistence and determination to ensure success have been outstanding.

Sgt. E. A. Waller, an observer who has been awarded the D.F.M. for bringing the machine home after his pilot had been severely wounded.

SERVICE AVIATION

Act. Sqn. Ldr. T. C. MURRAY, D.F.C., No. 207 Sqn.—This officer is a most sucessful operational pilot who has made a close study of enemy defences and tactics and of the most advantageous methods to be employed against them. The knowledge thus acquired from practical experience has proved to be of the greatest value in training new and inexperienced crews in operational flying. Sqn. Ldr. Murray has shown the greatest determination when attacking his objectives and has set a splendid example.

Flt. Lt. R. E. KIRKBY, D.F.C., No. 150 Sqn.—Flt. Lt. Kirkby has set an outstanding example of courage and skill. His efforts have been attended with much success, while his confidence, together with the excellent advice he has imparted to others, have contributed materially to the high morale of the squadron. He has always displayed an unconquerable spirit of determination to achieve his purpose. He has taken part in attacks on such important targets as Brest, Hamburg, Essen, Bremen and Emden.

Act. Sqn. Ldr. D. H. JACKLIN, D.F.C., No. 108 Sqn.—One night in June this officer was the pilot of a bomber aircraft detailed to attack the enemy near Fuka. After flying over the area for some two hours an enemy column was observed. Despite difficulties, Sqn. Ldr. Jacklin manœuvred to attack, but, whilst making his bombing runs, his aircraft was intercepted by a Ju. 88. In the ensuing engagement the bomber was repeatedly hit and the rear turret was put out of action. The aircraft lost height and was subjected to fire from the ground defences. Despite this, Sqn. Ldr. Jacklin, by skilful manœuvring, enabled his front gunner to deliver an effective burst at the attacking aircraft, setting the forepart on fire. He then flew his damaged aircraft safely to one of our landing grounds, where he made a skilful landing. Throughout this officer displayed great courage and determination.

DISTINGUISHED FLYING CROSS.

Act. Flt. Lt. D. H. KEARY, R.A.F.V.R., No. 115 Sqn.—This officer is employed as squadron gunnery leader. He has completed numerous operations as air gunner and participated in attacks on a wide variety of targets, including Berlin, Turin, Milan, Lubeck, and Munich. Flt. Lt. Keary is an outstanding and courageous air gunner who has always shown disregard of danger, combined with a most reliable sense of responsibility. Apart from operational flying, this officer has performed the duties of gunnery leader in a most efficient and energetic manner. Without doubt, the splendid example he has set has played a large part in maintaining the squadron's efforts and morale.

Act. Flt. Lt. A. E. MILLSON, R.A.F.V.R., No. 101 Sqn.—This officer has completed many months on operational flying. Throughout he has proved himself to be a very keen and reliable pilot and an excellent captain. He has always shown a determination to press home his attacks. His aircraft has been badly damaged by enemy fire on several occasions, but he has always returned safely to base. He has participated in attacks on most of the important enemy targets, including Cologne, Bremen, Rotterdam, Berlin, Turin, Lubeck and Rostock. His outstanding leadership and devotion to duty have set a very high example.

F/O R VAN DEN BOK R.A.F.V.R. No. 408 (R.C.A.F.) Sqn.—This officer has participated in numerous sorties against heavily defended targets, including attacks on Mannheim, Duisburg, Huls, Bremen, Kiel and Hamburg. He was the wireless operator/air gunner of a Hampden aircraft which participated in a low-level attack on the *Scharnhorst* during the battleship's escape from Brest. The aircraft was extensively damaged, including the wireless equipment, by the battleship's defensive fire. Skilfully effecting repairs, F/O. Van den Bok re-established communication with his base, thus rendering valuable assistance in the safe return of his aircraft.

His devotion to duty is such that, during the time he was detached from the squadron on a course he asked for 48 hours' leave in order to take part in his squadron's activities against Rostock. As squadron signals officer, F/O. Van den Bok has been mainly responsible for the high standard of work performed by the wireless operators of the squadron.

Act. F/O. W. C. HOLDEN, R.A.F.V.R., No. 138 Sqn.—As air observer, F/O. Holden has completed many sorties. Among them are many which have involved special navigational problems, all of which he overcame successfully. Despite bad weather and poor visibility, this officer has consistently displayed a high degree of skill, perseverance, and devotion to duty.

The bar parlour of "Ye Olde Messerschmitte." A scene in the Western Desert where beer is dispensed over the tail of an Me 110.

Act. F/O. C. E. WELLS, R.A.F.V.R., No. 12 Sqn.—This officer is a determined and skilful observer. He has participated in attacks on various important enemy targets, including Mannheim, Bremen, Kiel, Essen, Lubeck, and many others. One night in March, 1942, he participated in an attack on Essen. In the face of fierce opposition and searchlight activity, the target was successfully bombed from a height of 4,000 feet at the third attempt. F/O. Wells's dogged persistence on this occasion was an inspiration to his captain and the crew.

P/O. J. F. BROOKES, R.A.F.V.R., No. 103 Sqn.—Since September, 1941, this officer has participated in attacks on a wide range of important enemy targets, including Berlin, Mannheim, Brest, Essen, Cologne, Rostock, and Poissy. He is a cool and skilful pilot who always endeavours to obtain the maximum results. The bombing and photographic efforts of his crew have been among the best in the squadron. On one occasion during a low-level attack on a factory and power station near Paris, his aircraft was hit by anti-aircraft fire. The hydraulic system was damaged and the bomb doors partly fell open. With fearless deliberation, P/O. Brookes pumped the doors fully open with the hand pump and then successfully bombed the power station. In most trying circumstances this officer flew his aircraft safely to base where he made a safe landing with the undercarriage retracted.

On another occasion following an attack on a target in the Ruhr, the top half of the tail fin and the rudder of his aircraft were shot away by an enemy fighter. The rudder became jammed, but, despite fatigue, P/O. Brookes flew safely back to base, where he made an excellent landing without wireless aids. The enemy fighter which had attacked him was claimed to have been destroyed during the engagement.

P/O. E. C. BURT, R.A.F.V.R., No. 103 Sqn.—P/O. Burt's skill as a navigator has been of a high order. On many occasions his aircraft has made several runs over the target area to ensure greater accuracy and in order to take several photographs. P/O. Burt was never satisfied until he was definitely sure of his aiming point. His fine fighting spirit and quiet efficiency have won the confidence of all the crews with whom he has flown.

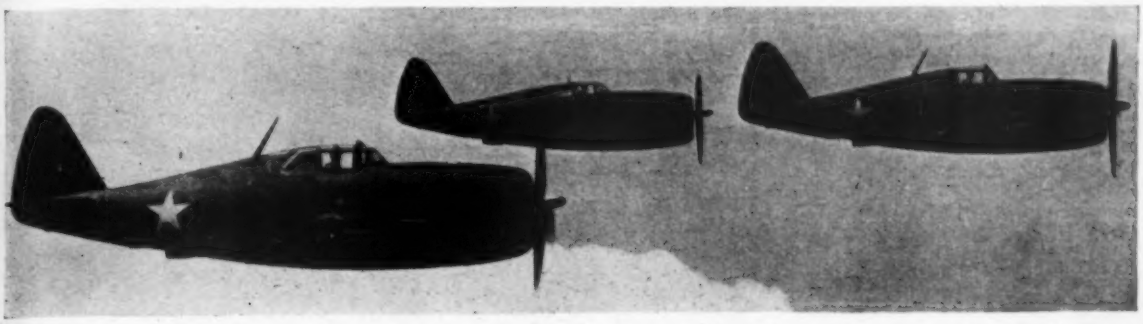
P/O. C. S. CAMPBELL, R.C.A.F., No. 103 Sqn.—This officer is a fearless and reliable navigator. His conduct when under fire, has proved of inestimable value to his crew. He has always endeavoured to concentrate his attack on the point of aim and allows nothing to deter him from his purpose. He has participated in attacks on numerous enemy targets, including Berlin, Stettin, Emden, Hamburg, and the Renault works near Paris.

P/O. G. COOKE, D.F.M., R.A.F.V.R., No. 106 Sqn.—Apart from routine raids, this officer has to his credit many outstanding feats of courage, skill and endurance. He attacked Lubeck with good results from 4,000 feet and made two low-level attacks on Ro-bock. In the second of his attacks on Rostock he performed valiant work when ordered to bomb certain buildings of the Heinkel works. His determination to secure photographic evidence of the successful bombing on this occasion was outstanding. This officer performs his tasks with supreme confidence and is one of the squadron's outstanding pilots.

P/O. B. D. CROXTON, R.C.A.F., No. 419 (R.C.A.F.) Sqn.—This officer, as an observer, has participated in two attacks on Berlin and attacks on Rostock and Lubeck. He is a first-class navi-

Raid damage assessor. An intelligence officer inspecting air photographs of German towns by the aid of a magnifying glass.

SERVICE AVIATION



Three of the new Republic Thunderbolt (P.47) fighters in formation. It seems that the design of the wireless aerial standard has had to be modified.

gator and bomb-aimer, whose abilities have contributed in a large way to the successes of the crews with whom he has flown. He has at all times displayed high qualties of courage, tenacity and initiative.

Distinguished Flying Medal

Flt. Sgt. (now P/O.) H. W. Ellis, No. 29 Sqn. During the past months Flt. Sgt. Ellis has carried out many operational sorties. He has displayed a high degree of skill and initiative. In January, 1942, he assisted in the destruction of a hostile aircraft after a long pursuit. Some time later, in extremely unfavourable flying weather, his skilful and accurate directions enabled his pilot to overcome a difficult situation and make a safe landing. During a sortie in June, 1942, he performed excellent work in an engagement with an enemy aircraft which was probably destroyed. This airman has always maintained a very high standard of efficiency, while his devotion to duty has set a very fine example.

Sgt. C. B. Carter, No. 68 Sqn.—In July, 1942, Sgt Carter was the wireless operator/air gunner of an aircraft detailed to attack a target near Lille. Owing to bad visibility the primary objective could not be located but an alternative was attacked from a low level in spite of heavy fire from the ground defences. During the run up Sgt. Carter silenced one enemy gun position but the aircraft was repeatedly hit by light anti-aircraft fire.

A cannon shell entered the gunner's cockpit, wounded Sgt. Carter in the right hand and arm, exploded a Verey cartridge and set some ammunition on fire. Despite his wounds, Sgt. Carter continued to engage the enemy, delivering effective fire at the enemy's gun positions. When the aircraft flew clear of the fire zone, Sgt. Carter extinguished the fire in the well of the aircraft and continued to man his guns. By his skilful gunnery this airman contributed materially to the success of the operation. He has completed numerous sorties and has always set a high standard of efficiency.

Sgt. P. D. Thomson, No. 28 Sqn.—One night in June this airman displayed great determination when attacking an important convoy off the coast of Italy. In spite of heavy defensive fire he pressed home his attack on the largest merchant ship from close range. His aircraft was hit in several places and the navigator was seriously wounded. Despite this, Sgt. Thomson flew the aircraft back to base and made a safe landing without the use of the hydraulics.

Flt. Sgt. V. S. Moore, R.N.Z.A.F., No. 57 Sqn.—One night in June, 1942, Flt. Sgt. Moore captained an aircraft which successfully attacked Bremen in bad weather. During the return journey to avoid the heavy clouds he descended to about 300 feet and whilst at this height he enabled his gunners to machine gun towns and factories en route. Shortly after crossing the enemy coast, considerable anti-aircraft fire was encountered from three armed ships. The starboard main plane was hit and set on fire, but Flt. Sgt. Moore turned and attacked the three E-boats.

The fire had now spread considerably, and as the aircraft would not maintain height, he was compelled to alight on the water. On impact the nose of the aircraft dived steeply into the water but Flt. Sgt. Moore and two members of his crew were able to scramble out and board the dinghy, from which they were rescued some 37 hours later. In the face of harassing circumstances this airman displayed great courage and fortitude.

Sgt. F. J. Moritz, R.C.A.F., No. 420 (R.C.A.F.) Sqn.—One night in June, 1942, Sgt. Moritz was the wireless operator/air gunner of an aircraft which attacked Emden. During the return flight his aircraft was intercepted by a Ju. 88. In the ensuing engagement Sgt Moritz was wounded in the leg while the rear gunner was seriously wounded and stunned. Sgt Moritz, despite his wound, gave skilful avoiding instructions to his pilot and, manning his guns, fired at the enemy aircraft which fell away and was probably destroyed. Sgt. Moritz then administered first-aid to the rear gunner before returning to his wireless set, which he manned until the aircraft landed safely at base. By his courage and determination Sgt. Moritz contributed materially to the safe return of his aircraft.

Flt. Sgt. J. B. Baker, R.C.A.F., No. 150 Sqn.—This airman is a skilful air gunner, who has a fine record of achievement. Possessed of a strong sense of duty, and a fine offensive spirit, he displays exceptional fearlessness in the face of danger. His courage and determination in action have been a source of inspiration to all air gunners in the squadron.

Flt. Sgt. D. W. Bale, No. 97 (Straits Settlements) Sqn.—Flt. Sgt. Bale is a keen and able air gunner. He participated in the low level attack on the Dortmund-Ems squeducts, and was wounded in the head and both legs. On another occasion, when his turret was put out of action, and he could no longer return the enemy's fire, he reported the movements of the enemy, and the attack was successfully evaded.

Flt. Sgt. (now P/O.) D. E. J. Bint, No. 150 Sqn.—This captain of aircraft has always attacked with determination and courage. On one occasion, when his port engine was hit and ceased to function, by exercising superb skill he returned and landed safely at base. Flt. Sgt. Bint has displayed great courage when in action, which is the admiration of all ranks in the squadron. His example has inspired a high standard of morale in his crew.

Flt. Sgt. F. Carter, A.A.F., No. 57 Sqn.—On the night of the 28th March, 1942, this N.C.O. was rear gunner of an aircraft detailed to attack Lubeck. On the return journey, when approached by an enemy fighter over the North Sea, Flt. Sgt. Carter opened fire, and the enemy aircraft appeared to catch fire as it dived away. He has shown a high standard of courage and devotion to duty throughout many operations, and has set an excellent example to all other gunners in the squadron.

Roll of Honour

Casualty Communiqué No. 147.

The Air Ministry regrets to announce the following casualties on various dates. The next-of-kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

Killed in Action.—Sgt. H. S. Barker; Sgt. T. Bateman; Sgt. P. G. Brothers; Flt. Sgt. W. N. Craig; Sgt. C. E. Graysmark; Sgt. G. J. Mugford; Sgt. D. E. Shrimpton; Flt. Sgt. M. E. Tomkins; Sgt. L. W. Webbe.

Previously Reported Missing, Believed Killed in Action, Now Presumed Killed in Action.—Flt. Sgt. W. B. Archibald; P/O. E. A. Bairstow; P/O. B. M. Cavan; Sgt. E. Crossley; Sgt. D. Francis; Flt. Sgt. B. Froude; Sgt. H. L. Hanson; Sgt. K. T. Hewson; Sgt. R. W. Lawson; Sgt. H. G. Luke; Sgt. R. Mackenzie; Sgt. A. McC. McLaren; Sgt. R. Mitchell; Sgt. J. Murphy; Sgt. G. H. Newton; Sgt. S. Perry; Sgt. R. A. Platt; Sgt. J. S. Poulton; Sgt. H. W. Sangerhaus; Sgt. A. H. Shattock; Sgt. A. R. W. Smith; P/O. R. B. Thomas.

Previously Reported Missing, Now Presumed Killed in Action.—P/O. W. H. T. Andrews; P/O. W. G. C. Beatson; P/O. J. W. T. Bromham; Sgt. R. Brown (1100635); Sgt. R. Brown (952523); Sgt. H. V. Butcher; Sgt. P. A. Champion; Sgt. A. Collier; Sgt. A. F. C. Couch; Flt. Sgt. R. A. Cousens; Sgt. D. P. D'Arcy; Sgt. D. G. Dennis-Smither; P/O. R. M. Disley; Sgt. S. T. Drew; P/O. J. B. Dunne; Sgt. C. R. Eastman; Sgt. J. Flint; Sgn. Ldr. R. G. Forshaw; Sgt. A. A. Gauld; Sgt. P. T. Giblett; Sgt. E. Gillam; Sgt. J. R. Gilmour; Sgt. J. Glover; Sgt. A. R. Harrington; Sgt. R. F. J. Henley; Sgt. E. W. Hewitt; Flt. Sgt. H. W. Hilton; A/C.1 W. A. Hodges; Sgt. R. Jackson; P/O. H. Jones; Sgt. R. W. Lancaster; Flt. Sgt. S. J. Lytle; Sgt. R. C. Matthews; Sgt. W. Miller; Sgt. M. J. Mills; F/O. G. W. Morris; Sgt. B. W. Nicholls; Sgt. J. D. Paine; Sgt. B. W. Palastanga; Sgt. L. Peaker; Flt. Sgt. E. L. Phillips; Sgt. W. L. Pointing; Sgt. D. R. Pritchard; Cpl. J. B. Robinson; Sgt. J. Shaw; Sgt. E. W. Sherwood; Flt. Sgt. J. M. F. Shiba; A/O. F. Simpson; Sgt. P. H. Stanton; Sgt. R. Straughan; Sgt. S. Thomson; Sgt. R. West; Sgt. H. V. Wilkinson; P/O. F. Wilson; Sgt. P. Wilson; Sgt. J. W. Woodall; Sgt. A. R. Wren; Sgt. E. P. Wright.

Wounded or Injured in Action.—Sgt. A. B. Charlwood; Sgt. S. A. Goodwin; Sgt. D. E. Llewellyn.

Died of Wounds or Injuries Received in Action.—Sgt. M. Molyneux.

Missing, Believed Killed in Action.—Flt. Sgt. R. A. Cripps; Sgt. F. J. Dodd; P/O. D. Percival; Sgt. M. Prescott; Flt. Sgt. G. Richard; Sgt. J. R. Stukins; Sgt. A. H. Wincott.

Missing.—Sgt. A. Bentley; Sgt. J. Collie; Cpl. F. J. Few; Act. Sqn. Ldr. J. E. Gorringe-Smith; Sgt. M. B. Green; Sgt. T. F. Grosvenor; P/O. J. A. Leslie; Sgt. E. A. Samuel; Sgt. T. W. Walker.

Killed on Active Service.—Sgt. A. Aston; Sgt. C. D. Barnett; Flt. Sgt. A. Bell; Sgt. E. R. Brooks-Clarke; P/O. W. J. Cole; Sgt. C. T. Daniel; P/O. T. E. Davies; Sgt. J. Eden; Sgt. E. E. Fraser; Act. Sgt. J. R. H. Gray; P/O. R. M. Goodhall; L.A/C. L. Hale; Flt. Sgt. R. J. Holloway; Flt. Sgt. J. N. Hopkinson; Flt. Sgt. M. R. Langham; L.A/C. V. W. Lear; P/O. F. C. Le Bon; Act. Sqn. Ldr. M. R. MacClancy; F/O. J. W. MacDougall; Sgt. C. McClean; Sgt. J. F. Mark; Act. Flt. Lt. A. H. Metcalfe, D.F.C.; A/C.1 E. J. Mitchell; A/C.2 T. E. Mitchell; P/O. L. Noble; L.A/C. P. G. M. Overton; L.A/C. D. S. Peattie; L.A/C. R. F. Randall; Sgt. L. D. Richardson; Sgt. H. R. Smith; Flt. Sgt. G. S. Wilson; Sgt. P. R. Wright.

Previously Reported Missing, Believed Killed on Active Service, Now Presumed Killed on Active Service.—Sgt. A. W. Allardice; Sgt. D. Brooksbank; Sgt. F. I. Russell; L.A/C. E. E. C. Snell; A/C.1 H. J. Tabern.

Previously Reported Missing, Now Presumed Killed on Active Service.—Cpl. N. B. J. Alexander; A/C.1 J. W. Bradley; L.A/C. S. V. Clench; Cpl. A. G. Crapp; L.A/C. N. J. Ficken; Sgt. V. E. Hill; Flt. Sgt. J. K. Pollard; A/C.1 N. W. Thomas; A/C.1 N. G. Thompson; A/C.2 W. Tonks.

Wounded or Injured on Active Service.—Sgt. E. C. Hatfield; L.A/C. H. J. Whiting.

Died of Wounds or Injuries Received on Active Service.—Sgt. S. Cox; P/O. H. R. Higgins; L.A/C. J. A. McCarthy.

Died on Active Service.—A/C.2 I. G. Badham; L.A/C. H. S. Beaton; Act. Flt. Lt. R. Beesley; Cpl. T. Bernini; A/C.2 F. G. Bryne; Flt. Sgt. K. W. Camps; Cpl. D. Goldie; L.A/C. J. H. Hales; A/C.2 B. P. Hamilton-Hunter; A/C.2 A. B. Hathaway; L.A/C. J. W. Haycock; L.A/C. R. Heap; L.A/C. H. R. Howe; A/C.2 R. C. Jacobs; A/C.2 A. Kay; A. C.2 A. J. Langdon; W/O. A. Malin; A/C.2 L. Meekin; F/O. L. D. Rollo; A/C.1 A. Spence; A/C.2 W. G. Strange; L.A/C. A. R. Williams.

Women's Auxiliary Air Force

Died on Active Service.—A/CW.1 E. A. Harvey.

Royal Australian Air Force

Killed in Action.—P/O. W. M. Pugh.

Previously Reported Missing, Believed Killed in Action, Now Presumed Killed in Action.—Sgt. R. W. Stephenson.

Previously Reported Missing, Now Presumed Killed in Action.—Sgt. V. L. Brown; Sgt. A. Cook; P/O. K. M. Hicks.

Missing, Believed Killed in Action.—P/O. L. G. Chick; Sgt A. J. Glaister; Sgt. M. B. Remfry.

Missing.—Sgt. J. P. Donaghy; Sgt. C. Gammie; Sgt. K. W. Heggaton; Sgt. J. F. Jacklin; Sgt. K. W. Kermode; Sgt. K. W. McIlrath; P/O. T. E. Roberts; Sgt. C. Scouller; Sgt. W. J. Smith.

Killed on Active Service.—P/O. C. W. A. Blick; Sgt. I. H. Christison; P/O. J. A. Sayer.

Died on Active Service.—Sgt. R. V. Elliott.

SERVICE AVIATION

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. E. H. Brown; Sgt. J. H. Gunyon.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. W. Colpitts; Sgt. A. L. Flesch; P/O. K. E. Hobson; W/O W. D. Page; P/O. W. A. Tanner.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. I. A. M. Barber; P/O. M. C. Blanchard; Flt. Sgt. R. J. A. Cleverdon; Sgt. W. A. Cross; Sgt. W. T. Hall; Flt. Sgt. J. L. H. Phillips.

MISSING.—P/O. R. D. Flitton; P/O. W. A. Hayworth; Sgt. R. W. Hood; Sgt. F. C. Main; P/O. A. D. J. Salt; Sgt. A. H. Winters; P/O W. A. White.

KILLED ON ACTIVE SERVICE.—Sgt. A. T. Baker; Sgt. T. L. Brown; Sgt. J. P. Hancock; Sgt. R. W. Hunter; Sgt A. G. Maxwell; Sgt. S. B. Moffitt; Sgt. A. J. Norwick; Sgt. D. K. O'Brien; P/O. A. Pensa; P/O. H. W. Russ.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. C. E. Caldwell.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. S. L. Harrison; Sgt. W. H. Rowles; Flt. Sgt. D. M. Russell; Sgt. H. B. Stevens.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. B. G. Hibell; P/O. M. D. D. McCarthy.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. J. Oliver.

MISSING.—Sgt. F. G. Barber; Sgt. W. N. Hollands; Sgt. I. H. Reeves; P/O. J. A. Sligo.

KILLED ON ACTIVE SERVICE.—P/O. E. A. Blair.

DIED ON ACTIVE SERVICE.—P/O. A. G. Clark.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. K. L. Lee.

South African Air Force

KILLED IN ACTION.—Air Sgt. M. B. Coetzee; Lt. T. D. Mainprize; Lt. J. B Huber; Air Sgt. C. A. Ryan.

MISSING.—Lt. I. Sedgwick.

KILLED ON ACTIVE SERVICE.—Air Sgt. A. G. McLoughland; Lt. K. Riddock; Lt. M. L. A. Gird.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Lt. F. C. Lorentz.

Casualty Communiqué, No, 148.

Royal Air Force

KILLED IN ACTION.—Sgt. E. Bailey; Sgt. H. S. Brown; P/O. C. C. Dickson; Sgt. G. Hill; Sgt. I. Jackson; Sgt. J. D. Kingdon; Sgt. J. McLean; Sgt. J. V. Magrane; Sgt. C. K. Nurse; Sgt. R. S. Parker; Sgt. G C Pearson; Sgt. M. G. Scanlon; Sgt. E. B. G. Sedgwick; Sgt. B. R. Steward; Sgt. J. L. Stuart; Sgt. B Thompson; P/O. S. J. Thorne; Sgt. S. Walker.

PREVIOUSLY REPORTED MISSING BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. Bain; Flt. Sgt. W. Barker; Sgt. F. F. De Smidt; Sgt. H. Greenwood; Sgt. S. Napier; Flt. Sgt. H. H. Penrose.

PREVIOUSLY REPORTED MISSING NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. C. K. Bremner; Sgt. J. Burns; Sgt. K. J. Chapman; Sgt. W. A. J. Davis; Act. Flt. Lt. C. G. Imlay; Sgt. R. E. J. Reeves; Sgt L. O. Smith; Sgt E. J. Sprange; Sgt. W. W. Stenning; Sgt. J. E. Wilcock.

PREVIOUSLY REPORTED MISSING BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Flt. Lt. J. Lockhart.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. A. J. Bradley; Sgt. A. W. Butteriss; Sgt. W. H. Chappell; Sgt. S. R. Dadson; Sgt. A. Dillon; Sgt. J. S. Elliot; Sgt. C. Gowman; Sgt J. T. Jones; Sgt. C. A. Lamb; Sgt. T. G. Morgan; Sgt. S. Peel; Sgt. J. Van Lelyveld; Sgt. J. B. Yule.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. R. H. Thomas; Sgt. H. E. Young

MISSING, BELIEVED KILLED IN ACTION.—P/O. G. Baker; Sgt. A. B. Columbine; F/O. A. M. Gregg; Sgt. T. B. Keegan; Sgt. N. Knight; Sgt. A. Miller; Sgt. C. F. Russell; F/O. R. B. Seddon; P/O. H. M. Stoffer.

MISSING.—Sgt. T. J. Bacon; Sgt. E. W. Baker; Sgt. J. F. Baxter; F/O. D. A. R. Bee; Sgt. S. E. Bradshaw; Sgt. C. H. Bryant; Sgt. J. Connell; Sgt. E. V. Davey; P/O. A. C. R. Downward; Sgt. J. R. Dryden; Flt. Sgt. H. G. Edwards; Sgt. J. T. Fallon; Sqn. Ldr. D. Godfrey; Sgt. J. H. Harries; Sgt. T. P. Hosking; Flt. Sgt. A. B. Johnson; Sgt. E. H. Jones; Sgt. C. H. King; Sgt. D. T. Male; P/O. L. T. Manser; P/O. R. W. Medus; Sgt. J. W. Moss; Sgt. H. J. R. Nash; Sgt. C. M. Parker; Sgt. R. T. Perrin; Sgt. J. W. Porteous; Sgt. H. C. Powell; Sgt. T. Pugh; Sgt. W. F. Reynolds; Sgt. A. L. Ridings; Sgt. E. Shepherd; Sgt. T. Smith; Sgt. W. D. Smith; Sgt. S. J. Vickery; Sgt. F. H. Walls; P/O. B W. Way; Sgt. E. F. Wear; Sgt. F. H. White; Sgt. R. Wigham; Sgt B Wilkes; Sgt. H. E. A. Willey.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. J. L. Smit.

KILLED ON ACTIVE SERVICE.—A/C.2 K. E. Anning; Sgt. R. L. Bilton; A/C.2 A. V. Brooks; Sgt. P. Bryant; Sgt. J. A. Carter; P/O C. D. Chant; Flt. Sgt. W. J. Coales; Act. Flt. Lt. F. X. E. De Spirlet; Sgt. J. S. Dewhurst, M.M.; Sgt. S. V. Duvall; A/C.2 R. A. Fisher; Cpl. T. J. French; L.A/C. E. F. Green; A/C.2 H. G. Hinks; A/C.1 D. Hocknull; P/O E. J. Hurst; Sgt. A. J. Jenkins; Sgt. G. D. Johnson; Sgt. H. Jones; Cpl. J. Jones; A/C.2 R. King; Sgt. J. A. F. Langham; Sgt. D. MacDonald; L.A/C. S. M. A. Mirza; A/C.2 E. R. Monti; F/O. J. G. Mutter; A/C.2 E. W. Neild; A/C.1 P. L. Patterson; Sgt. F. D. Payne; P/O. J. E. Sainsbury; Sgt. F. W Sims; P/O. A. W. Smith; Sgt. R. F. Snell; P/O. L. C. P. Stanynought; Sgt. R. W. Taylor; A/C.2 L. W H. Tegg; A/C.1 A N. Tracey; Sgt. W. S. Turnbull; A/C.1 R. L. Wilson; Sgt. W. J. W. Wiseman.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. W Armour; Flt. Sgt. C. R. Freeman; Sgt. P. P. Hussey.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. T. Blaylock; L.A/C. A. S. Coppin; Sgt. A. E. Dowsett; A/C.1 A. D. Griffiths; Sgt. E. C. Hirst; Sgt. R. G Hurst; P/O. H. R. H. F. Irwin; A/C.2 J. Lancefield; A/C.2 J. Lochhead; Cpl. S. J. O'Reilly; P/O. C. V. Reeves; L.A/C. M. Rogers; L.A/C. W. Stone.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/C.1 T. J. Argent; L.A/C. R. L. Farmer; Sgt. R. C. Luxom; Sgt. R. E. Russell; P/O. F. Wall.

DIED ON ACTIVE SERVICE.—A/C.1 G. Bate; A/C.1 H. Burgin; P/O. D. J. Bushel; A/C.2 E. A. Davies; P/O. R. D. Lewis; A/C.1 J. A. F. Marciano; A/C.1 W. Miller; L.A/C. B. V. Shaw; Flt. Lt. G. S. Stead; Cpl. D. L. Turnbull; Cpl. W. R. Walker; A/C.2 H. Watson; A/C.1 W. R. C. West.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. K. M. Cochrane; Sgt. G. H. Kirby.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. P. L. Browne; Sgt. N. G. S. Drummond; Sgt. L. R. Read.

WOUNDED OR INJURED IN ACTION.—Sgt J. R. Connors; Sgt. P. W. Fox; P/O. S. G. Sismey.

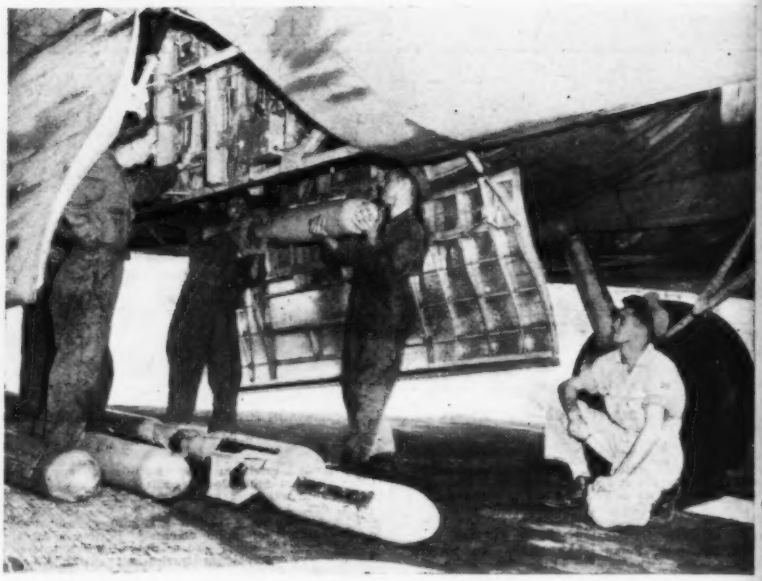
MISSING.—Sgt. V. J. Gallogly; P/O. R. McM. Harper.

KILLED ON ACTIVE SERVICE.—Sgt. K. M. Miegel.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. F. W. Wheeler.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. D. W. Alexander; F/O A. H. Wood.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. R. R. Thomson.



Stowing 100-lb. bombs in the racks of a Fortress. The bombs are held by lugs on their sides and mounted in four tiers. The bomb doors are electrically operated and have auxiliary hydraulic jacks for emergency use.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. F. H. Ewbank; Sgt. A. B. MacDonell; Sgt. B. H. Martin; Sgt. G. A. Morley; P/O. G. Smith-Windsor; Flt. Sgt. C. H. Tourville; Sgt G. J Wagner.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. S. Hamly; P/O. H. F. Hegarty; Sgt. A. L. Lewis; P/O. C. C. Lowther; P/O. C. L. Macdonald; Act. F/O. A. J. B. Monk; P/O. H. H. Pibus; P/O. F. R. Wellings.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. D. A. P. Clear; P/O J. L. Robertson

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. J. F. Halward.

MISSING, BELIEVED KILLED IN ACTION.—P/O. E. R. Howard.

MISSING.—Sgt. G. C. Evans; Sgt. J. A. Foran; Flt. Sgt. J. S. D. B. Gosselin; Flt. Sgt. A. H. Gudgeon; P/O T. E. E. Keyes; F/O. W. D. McCulloch; W/O. D. B. McGrath; Sqn. Ldr. I. G. A. McNaughton; Flt. Sgt. J. G. Morrison; Flt. Sgt. A. Stelmar; F/O. R. White.

KILLED ON ACTIVE SERVICE.—P/O. C. D. H. Archer; Sgt. W. Burnside; Flt. Sgt. D. A. Campbell; Sgt. J. G. J. Fedigan; Sgt. M. W. Fedirchyk; Flt. Sgt. G. H. Germain; Sgt K. C. Little; Sgt. C. G. MacDonald; P/O. L. G. Morrison; Sgt. D. R. Stewart.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. A. G. Smith.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. W. B. Blott, Sgt. R. G. Calder; Flt. Sgt. F. S. Hacey, D.F.M.; Sgt. W. A. Peters; Sgt. C. H. Wheatley.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. D. S. Woodley.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. R. E. Lloyd.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. L. Thomas.

WOUNDED OR INJURED IN ACTION.—P/O. G. Canning; Sgt. P. M. Sharplin; P/O. R. G. Tait.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. A. W. S. Evans.

MISSING.—Sgt. K. M. Dixon; P/O. J. D. McKeown; Sgt. G. L. Taylor.

KILLED ON ACTIVE SERVICE.—P/O. J. E. Casey; P/O D. I. Malloch.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—2/Lt. G. Donaldson.

PREVIOUSLY REPORTED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED IN ACTION.—W/O. N. C. Hoare.

KILLED ON ACTIVE SERVICE.—Lt. T. M. Reilly.

Indian Air Force

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. N. M. Sherriff.